FLIGHT
and
AIRCRAFT ENGINEER

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FIRST AERONAUTICAL WEEKLY IN THE WORLD : FOUNDED 1909

Editorial, Advertising and Publishing Offices: DORSET HOUSE, STAMFORD STREET, LONDON, S.E.1
Telegrams : Flightpres, Sedist, London. Telephone : Waterloo 3333 (50 lines.)

COVENTRY :	BIRMINGHAM, 2 :	MANCHESTER, 3 :	GLASGOW, C.2 :
8 - 10, CORPORATION ST.	KING EDWARD HOUSE, NEW STREET.	260, DEANSGATE.	26B, RENFIELD ST.
Telegrams : Autocar, Coventry.	Telegrams : Autopress, Birmingham.	Telegrams : Iliffe, Manchester.	Telegrams : Iliffe, Glasgow.
Telephone : Coventry 5210.	Telephone : Midland 7191 (7 lines).	Telephone : Blackfriars 4412.	Telephone : Central 4857

SUBSCRIPTION RATES : Home and Abroad : Year, £3 1 0. 6 months, £1 10 6.

Registered at the G.P.O. as a Newspaper

No. 1973. Vol. L. October 17th, 1946 Thursdays, One Shilling.

The Outlook

Mach Number a Back Number?

DEALING, as it did, with a subject of which the aviation student in general had been told very little, Mr. Smelt's Paper to the Royal Aeronautical Society was of outstanding interest in giving for the first time an outline of German research methods and results.

On the whole it would appear that in spite of the tremendous effort put into the design and building of research establishments, and the accumulation of data which they had made possible, Germany was not very far ahead of us, with our insignificant equipment, in aerodynamic knowledge. This fact should be accepted as a stroke of luck on our part and not used as an excuse for slacking in the future. Generally speaking, it was due to lack of appreciation by the military leaders of the importance of the contribution which German scientists could have made had there been better guidance and co-ordination. For that let us be duly thankful.

The expression "Mach Number" has been on the lips of everybody during the last year or two, and it has become the watchword—not to say catchword—in connection with all high-speed aircraft. Now Mr. Smelt largely debunks it by calmly telling us that it is of little significance. We are reminded of the story of the Swedish parson who preached a sermon in which fire and brimstone figured so liberally that he found his congregation in tears and despair to such an extent that he felt he had to do something about it and concluded by saying: "Don't cry, brethren, it may not be true after all."

Here we have been worrying about designing wing sections in which there is no steep pressure gradient so as to avoid the onset of local sonic speeds, and now Mr. Smelt tells us we need not worry, aerofoils so designed are no better, from the point of view of ultimate drag-rise, than conventional sections.

Mr. Smelt's Paper disclosed a fact of which we have no cause to be proud. The benefits to be derived from sweep-back in the matter of delaying the shock-stall were foreseen several years before the war by a German scientist (Busemann is credited with it but there appears to be some doubt as to who really should have the honour), but no one in this country appreciated its significance. It would not surprise us in the least if someone were to discover that an Englishman was the first. Did we not for many years ascribe to Dr. Prandtl the induced drag theory which had actually been first formulated by that great Englishman, the late Dr. Lanchester. History may quite well repeat itself in connection with sweep-back. It may even be that something on the subject will be found in Lanchester's books, *Aerodynamics* or *Aerodonetics*, of which the younger generation has probably never heard.

The College of Aeronautics

LAST Tuesday, with no fanfare of trumpets, the College of Aeronautics was opened to students. We gather that the official opening ceremony will not take place until early next year, but in the meantime it is good to know that a start, even if a modest one, has been made. There was no time to lose, as it is more than three years since the suggestion to establish a university of aeronautics was first made by Mr. F. G. Miles and immediately followed-up by *Flight* and its associated journal *Aircraft Production*, which published articles on the subject by Sir Roy Fedden, Capt. Pritchard, as well as by Mr. Miles. Meetings were held at which the subject was discussed.

Lord Camrose furthered the proposal by publishing in *The Daily Telegraph* an appeal by Mr. Geoffrey Smith, editorial director of *Flight*, and supporting it with a leading article.

This campaign continued from January to June, and

in July Lord Cherwell announced in the House of Lords that the Aeronautical Research Council had been directed to look into the possibility of founding a school of aeronautical science. The A.R.C. presented its report on August 10th, 1943, and in December of that year Sir Stafford Cripps announced approval of the recommendations and the appointment of an inter-departmental committee under the chairmanship of Sir Roy Fedden. The report of that committee was published in October, 1944.

There need be no uneasiness about the relatively modest way in which the College of Aeronautics is starting. From the national point of view it was far better to build-up the College gradually than to wait until it could be finished and fully equipped. From the students' point of view those who are among the first should benefit from the fact that they will have to create and build to a considerable extent the equipment with which they will later be working. That is an advantage which subsequent students will not share.

Circuit Sorting

DURING and after next week some rather more detailed and involved air traffic rules are brought into force to deal with the collision risks at Northolt and London Airport. These supersede the previous scheme with which, in differing conditions, right- or left-hand circuits were made at the two airfields.

The new scheme is sound as far as it goes, and is intended to control the position of the areas covered by the two circuits—which are now left-handed in each case. Vertical stacking is to be used when congestion demands, and arrangements are made to suit the aircraft equipment carried.

But too much, it seems, is still left to the crews themselves. Air Traffic Control has neither the power nor the detailed knowledge to do much more than issue instructions to the aircraft, and hope that these will be followed. All will be well while movements are few, but a system must, in the end, be instituted by which Control really *can* control, and is possessed of continuous knowledge of the whereabouts of each and every aircraft.

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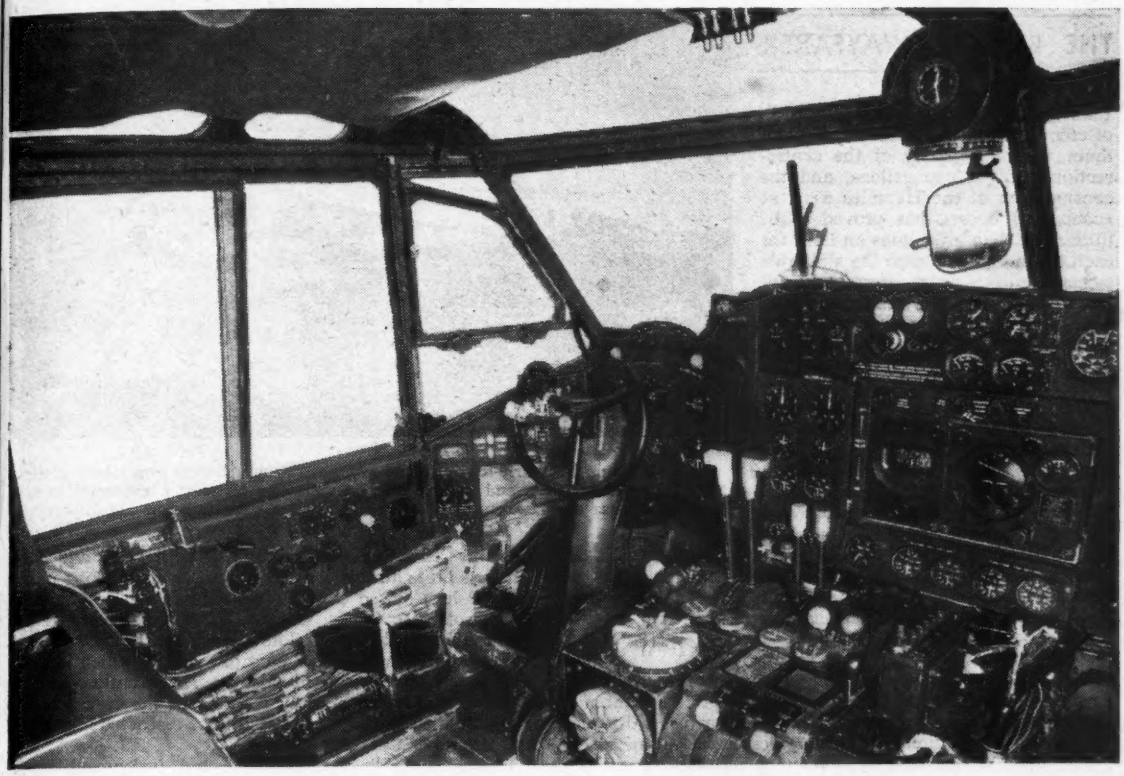
S. OF S. ON TOUR: Within a few days of his appointment as Secretary of State for Air, The Rt. Hon. Philip Noel-Baker spent a day at the R.A.F. Stations at Wittering, Waddington and Hemswell. He is seen inspecting a D.H. Hornet fighter of No. 19 Squadron. Flt. Lt. J. D. Furneaux, pilot of the Hornet, is his guide.



The Bristol Wayfarer

The Passenger Version of the Type 170 in Action : A Straightforward Aircraft with Solid Qualities

IN THE AIR—XXI

By "INDICATOR"

WITHOUT a capacity for mind-reading in an imaginary timeless world, it would be hardly possible to know exactly the thoughts in the designer's mind when he laid out the plans for the Bristol 170 in its original form. But certainly it can be taken that the machine was intended primarily to fulfil the need for a robust, comparatively short-haul freighter pure and simple. The conditions of the post-war world, however, caused an immediate demand for passenger-carrying rather than freighter aircraft, and the Wayfarer was consequently developed more or less concurrently with the original Freighter prototype. Both were entirely private ventures, and the fact that orders for more than seventy of the types have already been received suggests that the formula, though originally worked out for rather specialized purposes—and even considered by some to be retrograde in conception—has plenty of merit in the eyes of the various operators. The 170 can reasonably be thought of as a modernized and more practical version of the "workhorse" aircraft exemplified by the Ju. 52, which, in spite of its faults, has probably given a longer period of useful service than any other type so far made.

UNTIL now "Indicator" has been dealing in this series with wartime military aircraft, on most of which he has had considerable testing and ferrying experience. In this and later articles, he will deal with present-day civil types.

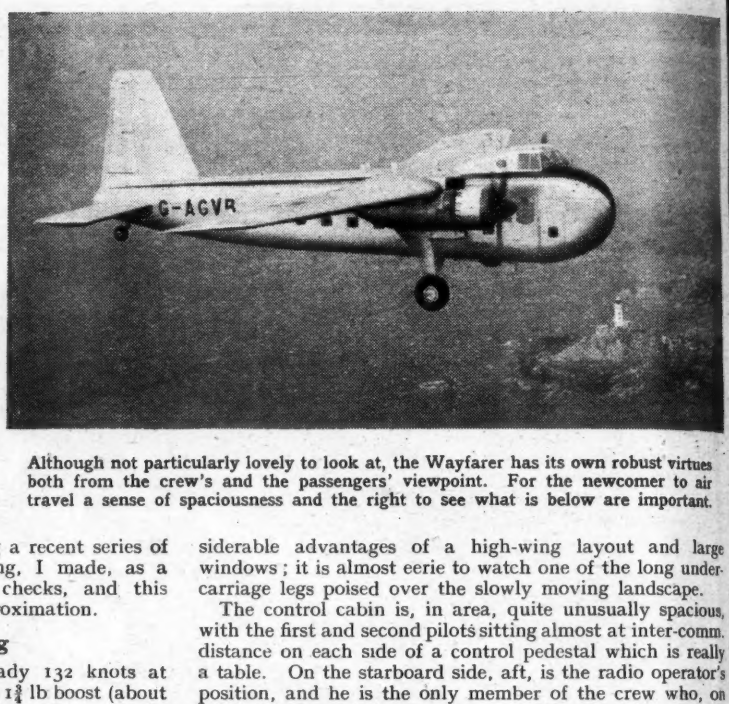
Now peacetime conditions are likely to be restrictive—and especially so for any essentially non-professional pilot. Civil aircraft are not always to be flown merely for the asking; nor is it generally possible to put in more than a few hours in each type—and not necessarily as the pilot in ultimate charge. For half a dozen reasons the days have gone when any "accepted" all-type pilot could take forty-thousand-pounds' worth of aircraft away by himself after a mere study of the pilots' notes.

Save in the case of the majority of smaller types, therefore, the impressions in this new series may need to be qualified by conditions. But they should be interesting and instructive not only against "Indicator's" background of experience with military types, but also with two score or so of pre-war civil aircraft.

Certainly, the need for designing a fuselage to accommodate bulky as well as heavy loads has produced somewhat extraordinary conditions for the Wayfarer's passengers and crew. The former can sit and move about in a cabin of more than comfortable dimensions, while the latter, perched in what can really be described as a "flight deck," above the cabin and ahead of the leading edge, have a quite unusually good view of the world at large, both while on the ground and in the air.

Since the Wayfarer is primarily intended for short-range heavy-duty work, there may be a prevalent idea that the possible maximum endurance is a low one. For such delivery trips as that across the Atlantic extra tanks are installed in the fuselage, but even the standard tankage offers a safe range of more

THE BRISTOL WAYFARER



Although not particularly lovely to look at, the Wayfarer has its own robust virtues both from the crew's and the passengers' viewpoint. For the newcomer to air travel a sense of spaciousness and the right to see what is below are important.

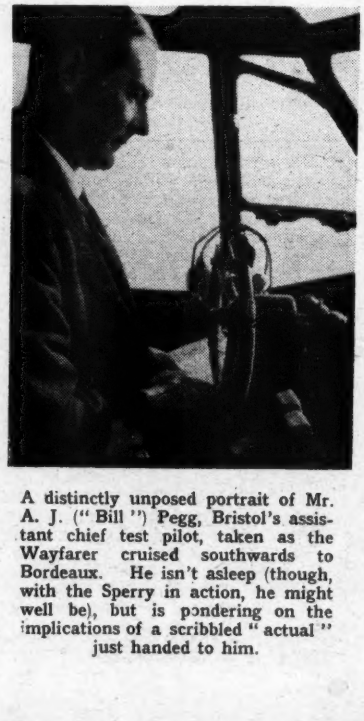
than a thousand miles—though with, of course, a reduced load. The maximum normal capacity of the centre-section tanks is 600 gallons, and the consumption of the Hercules 632s, at economical boosts, has proved to be little more than 40 gallons an hour for each engine. Work with the slide-rule suggests that, apart from take-off, climb and necessary reserve allowances, the ultimate endurance is 7½ hours—so a figure of 5½ hours can be taken as being a safe maximum endurance in all conditions.

Despite its comparatively low wing-loading, its by-no-means slim fuselage and its fixed undercarriage, the Wayfarer gets along very nicely. At 5,000ft its maximum is 221 m.p.h., but the important thing is that it has a genuine cruising speed of more than 150 m.p.h. at quite low boosts. During a recent series of trips, totalling some seven hours' flying, I made, as a supernumerary second pilot, periodic checks, and this cruising-speed figure is no academic approximation.

Economical Cruising

The A.S.I. would be showing a steady 132 knots at 2,000ft while cruising at 1,800 r.p.m. and 1¾ lb boost (about 50 per cent power). Corrected for temperature, altitude and the small position-error, this gives a true air-speed of 157 m.p.h. Actually the 130-knot-plus indicated speed can be held up to 5,000 ft—which is, consequently, the best cruising height. The run from Whitchurch to Bordeaux, as an example, was covered, from take-off to landing, in 3 hrs 25 min. The wind component was, if anything, distinctly adverse, particularly in the earlier part of the journey, but, if my estimate of the straight-line distance—470 miles—is correct, the block-to-block speed works out at 138 m.p.h.

The later wartime lesson of "high boost-low-revs," reversing previous ideas for economy and engine durability, has now become universally learnt. While flying the Wayfarer in service, only at take-off are the revolution figures ever higher than about 2,300 r.p.m., and after take-off the c.s. controls are pulled back *before* the throttles—a movement which would have shocked the junk-head-conscious pilots of earlier war years. 1,800 r.p.m. or less is the usual cruising figure. At these sorts of engine speeds the two Hercules settle down very comfortably. Though, at the moment, the Wayfarer is, by reason of exhaust "thump," somewhat on the noisy side, work is proceeding on the development of a less direct exhaust system. At the rear of the passenger cabin the decibel standard is normal to good, but farther forward there is a degree of exhaust noise which might possibly be irritating over periods of flying longer than those for which the aircraft is intended. All of which is the result of conversation with passengers rather than of my own short experiences in the public "hold"—my ears have long since been made largely immune to noise by Herefords and things. To balance this feature, the passengers have the very considerable advantages of a high-wing layout and large windows; it is almost eerie to watch one of the long undercarriage legs poised over the slowly moving landscape.



A distinctly unposed portrait of Mr. A. J. ("Bill") Pegg, Bristol's assistant chief test pilot, taken as the Wayfarer cruised southwards to Bordeaux. He isn't asleep (though, with the Sperry in action, he might well be), but is pondering on the implications of a scribbled "actual" just handed to him.

The control cabin is, in area, quite unusually spacious, with the first and second pilots sitting almost at inter-comm. distance on each side of a control pedestal which is really a table. On the starboard side, aft, is the radio operator's position, and he is the only member of the crew who, on a long flight, might be considered to be restricted in personal movement

The normal Wayfarer control and instrument layout may be described as being organized almost entirely for the captain's benefit. Since all such layouts must, as far as possible, be standardized among variants of a type, this arrangement is the most practical from all points of view, particularly as the Freighter, for instance, will normally be crewed by a captain and radio operator only. Although the first officer can reach all essential controls with an effort, the planning of the entire cabin is obviously intended to ensure that the most important member of the crew has everything he needs within very comfortable reach and sight. There are, however, two individual standard blind-flying panels with, when it is fitted, a Sperry automatic pilot panel in the centre.

Incidental Controls

On the left of the captain's b.f. panel there are the electric gill controls and indicators, the priming and starter buttons, the various fuel warning lights and the concomitant master switches. The main engine switches are in the roof, with, behind them, the emergency fuel-isolating controls. Also on the captain's left are the outside-to-inside accumulator switch, and the control for the electrically operated intake shutters. Three forms of air supply can be obtained—cleaned, direct "ram," or warm air. If, while running on "ram," the ice guard becomes obstructed, the warm-air shutters open automatically. Farther round on the captain's left are most of the navigation and landing light control switches, with his own windscreen-wiper control. The screen de-icing fluid pump is on the control pedestal.

On the right of the captain's panel are the fuel booster press-button

switches and the flap-position indicator, while on his side of the Sperry panel are the boost gauges, revolution counters and oil temperature and pressure gauges. The head temperature indicators are above the Sperry panel. Here also, so that they can be reached by either pilot, are the feathering buttons, the switch controlling the "doors-closed" lights, and the necessary signalling switches for the passengers, warning them to organize their own take-off and landing drill.

The broad, flat main pedestal carries, from left to right, the throttles, constant-speed controls and cut-off levers, with, on the left, and farther aft, the three-position flap lever and the trimmers, each working in the correct sense. In the rear of the pedestal are the two fuel cocks and the cross-feed control. The fuel system, incidentally, could hardly be more simple. Though there are, in fact, four tanks, each of 150 gallons capacity, in the centre-section, these are coupled in pairs with non-return valves, and there are, therefore, only two cocks. The cross-feed cock is used only when it is necessary to feed a good engine from the tanks on a dead engine side; it is not a balance control. Fuel-booster pumps are used, but these need not necessarily be left in the "on" position during normal cruising flight. The fuel contents gauges, below the Sperry panel, show the levels in all four tank sections.

Important Incidentals

Very conveniently positioned on the captain's side of the throttles is the tailwheel locking switch, with its warning light. The lock is moved electrically by a solenoid, so that, when the switch is moved to the "on" position after turning on to the runway, the lock duly goes home as and when the tailwheel lies fore and aft. Also on the main control bank is the master switch for the flaps. Unless this is on, no power is supplied to the motor driving the hydraulic pump. While in flight it should either be left continuously on, or switched on from time to time to prevent the flaps from drooping.

The captain's seat is adjustable both for height and for fore-and-aft positioning, and can be arranged so that the control column sits comfortably in one's lap. Incidentally, the control-locking system is semi-automatic and "built-in." The locking arm is attached to the structure, and when it is swung over and linked to the aileron wheel the action also locks the rudder. I never liked either the built-in locks or those nasty separate bits of ironmongery which never seem to fit; this seems to be an effective compromise. When not in use it is tucked away at the side. Screening on the Wayfarer is, coupled with the advantages of the control cabin location, more than usually adequate. There are two nice, deep, flat screen panels with clear-vision windows on each side, and the usual lockable sliding windows farther aft. More important still, there is a very reasonable transparent area immediately above the main screen, and this—though the effect is no doubt largely psychological—gives one the impression of greatly improving the all-round view, and particularly while turning in an airfield circuit. Transport aircraft are too often lacking in view for the crew in any but the designer's idea of "essential" directions. There is an emergency hatch in the roof above the wireless operator's station. So much for the somewhat dull but necessary "vocab" list of devices and their positions.

Since the layout of the Wayfarer is simple, the take-off and approach drill for the crew is also comparatively straightforward, and almost the only heavy thinking required at the end of the runway concerns the standard checking procedure for the engines. Once these have been run up there are very few other things about which to bother. The gills are set in the half-open position, the airscrew controls checked fully forward, ram or clean air set on the intake control, and the fuel boosters checked "on." No flap is normally used, and the trimmers are left, with minor individualist variations, in their neutral positions.

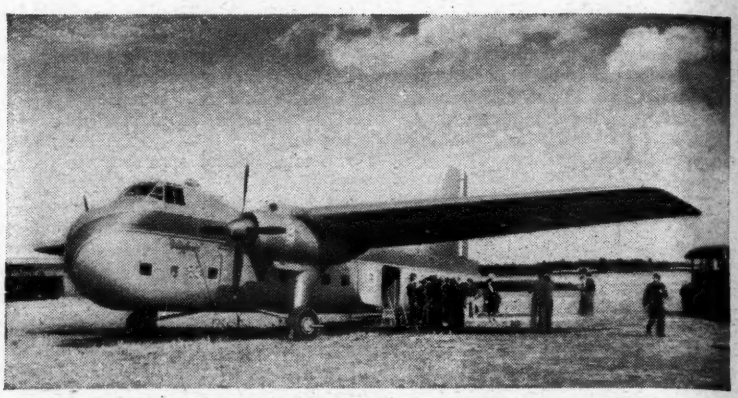
It is best, after the aircraft has been lined up on the runway, to open up to zero boost on the brakes—during which process the inner workings of the engines can again be instrumentally checked. The throttles are long, close together and move with pleasantly damped smoothness—the dampers, incidentally, are unusual in operation, but common sense. As soon as the brakes are released the throttles can be opened up rapidly to 7½ lb boost; there is no need for differential action, since any deviation from the straight can be held quite comfortably on the rudder. A moment or two after maximum boost has been reached the tail can be lifted and the aircraft is then held until an air-speed reading of about 80 knots is shown. For one reason or another the Wayfarer, when normally trimmed and loaded, shows no signs of flying itself off, and at this speed the column is brought back smoothly over quite a wide angle before it becomes airborne. I must say that, even on my first and only take-off, no difficulty was experienced or particular effort required. We just bowled down the runway in conventional manner, and the Wayfarer duly became an airship at the word of command. As soon as safety speed (105 knots) has been reached, the revolutions can be brought back to 2,400 and the throttles to the rated boost setting. Although the best rate of climb is obtained at a speed of about 110 knots, it is better, for reasons of engine cooling, to hold about 130 knots.

Asymmetric Flying

No attempt was made to simulate engine-failure conditions on this take-off, since it was being made from an important Continental airfield and the nervous systems both of the "safety pilot" and various passengers had to be considered—not to mention my own. But a certain amount of asymmetric flying at various speeds had previously been carried out during a demonstration flight, and there certainly appeared to be no handling difficulties or signs of instability. The Wayfarer can, in fact, be held very comfortably on the rudder without re-trimming, while it will turn happily in either direction. The best speed for real emergency one-engine climbing is 100 knots at 6½ lb and 2,400 r.p.m. In heavily loaded or otherwise difficult conditions it is safe to run an engine at the maximum figures of 7½ lb and 2,800 r.p.m. for periods up to a quarter of an

Another view of the 170—actually of the prototype Freighter in its earlier days—which gives an idea of the aircraft's plan form and of the position of the flight deck.

THE BRISTOL WAYFARER



The Wayfarer at Merignac airfield, Bordeaux, just after its arrival from Filton, via Whitchurch. On the following morning it was flown to Le Bourget, Paris.

hour—by which time adequate height should have been obtained and it will be possible to pull everything back a little.

The majority of the flying on this particular trip was done by our old friend Mr. Sperry, and his smooth reflexes gave good evidence of the cruising normality of the three controls. Of these the rudder is undoubtedly the best from all points of view, with the ailerons comfortable by transport standards, and the elevators a shade on the sensitive side. Apparently the majority of pilots, when taking over for the first time, are inclined to over-correct on the latter for a moment or two until their reflexes have been suitably adjusted. I must say that, though no one had warned me of this difficulty, I noticed nothing peculiar, in spite of the fact that passengers were moving about down below. But then I was always brought up to fly bigger aircraft on the fore-and-aft trimmer rather than on the control column. More care on the elevator control is necessary when the flaps are fully down and at lower speeds, when the control is, so to speak, a little inclined to come away in one's hands.

Again, though the Wayfarer's movements may have been somewhat unsteady as a result of over-zealousness, I found no marked difficulties during my first approach, and the landing itself seemed to be extremely easy. There is ample elevator control at the last moment, and it is possible even to make a tail-wheel-firster if the full movement is used. With no very good idea of the ultimate approach angle at 90 to 100 knots with full flap, I was using varying boosts and was consequently making conditions unnecessarily harsh for myself. Such variations in approach power produce changes of trim, and the pilot who is accustomed to the type will endeavour to come in at constant power, closing the throttles fully only for the hold-off and touch-down. In these circumstances an effort-free approach is possible.

While on the subject of arrivals, it should be added that the power-off stall is gentle and straight; only with lots of urge to produce a larger angle of attack does the stall become a reality, with the usual buffeting and a torque-reaction fall-away of the starboard wing. In these conditions the critical speed can be as low as 45 knots—which should be slow enough for small fields.

The handbook stall, with flaps fully down and throttles closed, is, at the maximum all-up weight, some 53 knots. Using care and plenty of power, very short arrivals can be arranged, but in these the throttles are left open until the moment of touch down, since otherwise it is more than possible to G-stall the machine while checking. The best final approach speed is probably about 85 knots in normal conditions, and, provided that there is a reasonable amount of landing area available, the handling in rough weather is much improved if a half-flap setting is used. That, in fact, is the recommended practice.

Several times during the trip I thought of a long period three years before when, with only one other occupant and a lot of lethal gear, we used two Hercules to become satisfactorily airborne in Beaufighters. Yet here I was, with two very similar units producing much the same power, assisting in the conduction of a thirty-six seater affair. Swords to ploughshares.

S.E.A.C. STORY

THE Press Club was honoured by the presence at lunch on October 10th of Admiral Viscount Mountbatten, Admiral Lord Fraser, Admiral Sir Arthur Power, General Slim and Air Chief Marshal Sir Keith Park—all yesterday's Commanders-in-Chief in the Far East, under the supreme command of Lord Louis Mountbatten.

The inside story of S.E.A.C. was revealed in witty and brief phrases by the speeches, of which the outstanding one was made by Admiral Power who had the advantage of batting first, whilst Air Chief Marshal Sir Keith Park was severely spiked in his praises in that the other Services had given generous tribute to the inestimable value of air support, mainly in transport aircraft.

Lord Louis, for instance, cited the appalling conditions under which flying took place. He said: "I know of no instance of an aircraft going into the dreaded cumulus nimbus clouds and coming out of them safely the other side."

Referring, not bitterly but factually, to the shortages, Lord Louis said that he had heard of an Air Force working double and even treble shift for short periods of two or three days, and perhaps a week, but the S.E.A.C. Air Forces performed this overload work for months on end. He threw into perspective the degree of support given, saying that the R.A.F. lifted 615,000 tons by air in the Burma campaign. At the peak month 94,300 tons was flown by the R.A.F., including 13,000 casualties evacuated. The American peak was 75,000 tons in one month. Only one quarter of the casualties were flown out by American forces.

General Slim in clipped phrases gave a brilliant bird's eye view of the Burma story. He mentioned: "I arrived at Kohima in the nick of time. There was an enthusiastic Wing Commander of the R.A.F. who was just about to go off on a strafe of General Sato's H.Q. I was just in time to stop this—for if Sato had had an ounce of military sense he would have by-passed Kohima instead of fighting it out with us. The Jap is not a man or a beast: He is an insect, an ant, with all its failings." General Slim heaped praises on the R.A.F., and his staff, who, he said, had a motto: "What you order is impossible, but we will arrange."

The mystery of the price of an Avenger was neatly solved by Admiral Lord Fraser. He had asked for six Avengers, and the American staff officer who met him said: "Sure you can have 'em, for a bottle of Scotch you can have a dozen!"

The speech of the day was made by Admiral Power; blunt, rugged, bulldog-breed stuff (as many who met him in the *Ark Royal* in 1938-9 will recall). Among his wisecracks were the following:—

"Even the Chief Censor (Rear Admiral Thompson) is here today as a gentleman."

"Anyway, we are not today honouring Errol Flynn."

"Just before Christmas, 1943, we sailed, with two carriers. We also had three battleships—total age of which was more than 100 years. We went to Trincomalee—the sailors called it Scapa in Technicolour . . . It was a perfect naval base—there was nothing whatever there."

"Lord Louis' forces oscillated between England and Bombay. Sometimes they got to Gibraltar; occasionally they reached Suez before breaking down; and a few, which failed to get the signals cancelling their sailing orders, slipped through and formed the base of the S.E.A.C. Fleet."

HERE AND THERE

Lord Tedder at the wheel of a 1903 5 h.p. Humber, during the "Jubilee Cavalcade" in King's Park, Edinburgh. The Earl of Rosebery (with walking stick) inspected the ancient vehicles after a procession through the city.

The Cold Facts

A CHANCE to see for themselves how their products behave (or even misbehave?) under severe Service conditions has been presented to a number of British firms manufacturing aircraft and aircraft equipment.

They have been invited to send representatives to witness trials under arctic conditions which are being carried out by the R.C.A.F.

R.C.A.F. Appreciation

DURING the war, Mrs. Leonard Hancock threw open her home in Belgravia, London, as a leave centre for officers of the R.C.A.F.

Now Mrs. Hancock—or "Ma" as she was called by many of her Canadian guests—is on a visit to Canada and was recently given a Mess reception by the R.C.A.F. in Ottawa as a token of appreciation of her wartime hospitality. At the reception, attended by a number of very senior officers, Mrs. Hancock was presented with a framed R.C.A.F. crest by Air Vice-Marshal W. A. Curtis, the Canadian Acting Chief of Air Staff.

Historic Models

MRS. LANCHESTER, widow of the late Dr. Lanchester, has presented the Royal Aeronautical Society with her famous husband's original flying model aircraft with which he experimented in June, 1894.

To quote from Dr. Lanchester's celebrated book, *Aerodonetics*, the result of these experiments was "to confirm the author's views as to the possibility of securing automatic stability without the employment of any equilibrium mechanism or 'brain equivalent.'"

The models, designed before any man had flown, made flights up to 600 yd and lasting 27 sec, and they played a significant part in the building up of the famous doctor's theory of flight set forth in *Aerodynamics* and *Aerodonetics* (1907 and 1908) which put him so far in advance of any contemporary and are a lasting monument to his genius.

Aerial Emigration

FROM time to time there has been reference in these columns to young ex-R.A.F. pilots who despairing of getting a normal passage to some part of the Empire, have managed to acquire light aircraft and fly themselves—and sometimes their families too—to their new homes.

Following on the gallant migratory effort of Messrs. Brownlow and Redman, who persuaded the veteran Swallow, illustrated below, to carry them to Cape Town (with so many delays for running repairs that their motto must now be "Per Ardua Ad Africa"), comes news of a brace of Austers setting off for Ceylon.

This trip is being made by Mr. J. P. Obeyesekere, owner of VP-CAO, returning home from Cambridge University with Mr. Ralph H. Sleigh (ex-R.A.F.) as pilot, and ex-R.A.F. Sqn. Ldr. R. A. Farquarson flying his own machine, VP-CAP.

The flight schedule allows for 25 "hops" and flying costs are estimated at £40 per aircraft.

The "Styled" Tudor

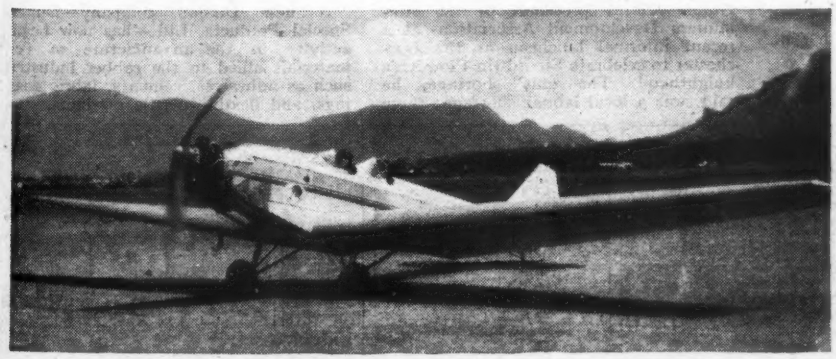
MUCH of the work of Mr. Richard Lonsdale-Hands, the industrial designer, can be seen at the "Britain Can Make It" exhibition at the Victoria and Albert Museum, South Kensington, for it is to be found in a variety of spheres ranging from television and scientific instruments to humble domestic appliances.

A notable example, however, is the "styled" interior of the Avro Tudor II airliner which Mr. Lonsdale-Hands has executed for B.O.A.C., and this was one of the exhibits to which the Prime Minister paid particular attention when he visited the exhibition with Mrs. Attlee a day or so after its opening.

All in the Day's Work

AS fellow Pressmen we sympathise with the Press photographer who was recently "stung" for £20 by the Manchester Justices for flying comparatively low over an Old Trafford cricket match to get his pictures "without the permission of the Minister of Civil Aviation." Our sympathy equally goes out to his worthy pilot, also fined £20, especially as evidence showed he endangered nobody.

The incident reminds us of when, long years ago (in our wild youth!), we were flying a tough little Irish Press photographer in a Gipsy Moth to take pictures of an important



MIGRATORY BIRD: This is the elderly B.A. Swallow (90 h.p. Pobjoy) in which Messrs. C. Brownlow and D. Redman flew to Cape Town (as reported in *Flight*, Sept. 19th), having tired of waiting for a passage. They bought it in Scotland for £625 and did the trip in 90 hr flying time.

HERE AND THERE

outdoor gathering, no high-wing monoplane being available at the time.

"Can yer not tip the damn thing up a bit more and git this wing out of me way?" bellowed Paddy from the front seat as we circled at a slightly illegal altitude.

It being quite impossible to persuade Paddy that bank and rate of turn could not be entirely disassociated from each other, we had to indulge in some rather "dicey" slide-slipping to satisfy this fearless picture-snatcher.

We *ought* to have been "pinched," but were not!

U.K. Trade Mission to China

TWO Transport Command R.A.F. aircraft set off recently from Northolt carrying the United Kingdom Trade Mission on its 10,000-miles journey to China.

The Mission, led by Sir Leslie Boyce, comprises nine members and a secretariat of three. It will study the possibilities of increasing trade between Britain and China and will travel many thousands of miles by air inside China.

The aircraft, a York and a Lancastrian, have been specially fitted out to make the Mission self-sufficient. One carries engineers, spare parts and repair equipment. The other has an office, complete with desks, typewriters and filing cabinets. The secretariat will use this office for the collection of material for the compilation of the Mission's report.

Back in Canberra

THE Duke and Duchess of Gloucester concluded a nine-day tour of Western Australia at Perth last week-end, and then flew back to Canberra in their Avro York, *Endeavour*.

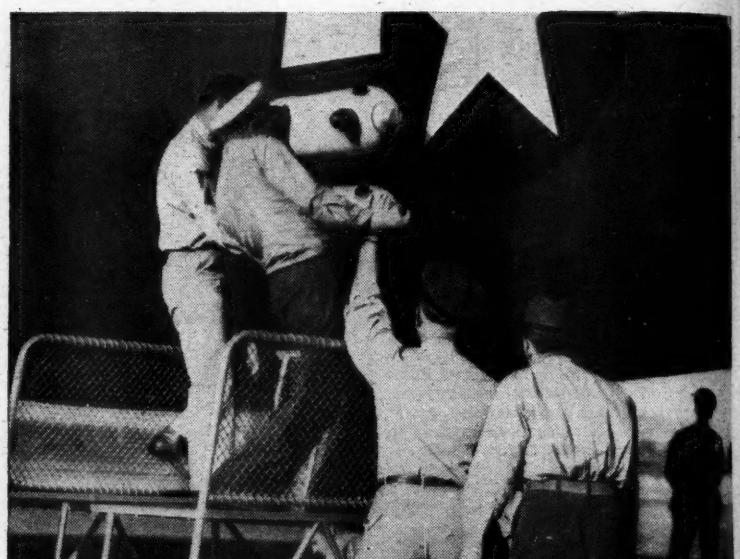
The statute distance of 1,995 miles was covered non-stop in 7 hr 50 min, giving an average ground speed of 254.68 m.p.h. Top speed at any time was given as 275 m.p.h.

"A" Licence Scholarships

TWO 19-year-old Midland girls, Betty Welsh and Hazel Lewis, were successful last week in winning courses of free instruction for pilots "A" licences under the scholarship scheme initiated by the Women's Junior Air Corps.

The two girls qualified at Wolverhampton airport, each undergoing a half-hour flying aptitude test with an instructor after 15 min preliminary "dual" instruction.

The scholarships are each worth £60.



INITIAL URGE. The Lockheed Neptune of the U.S. Navy which recently achieved a record 11,236 mile flight non-stop from Perth to Columbus (Ohio) used rocket-assisted take-off, the "Jato" bottles being attached to the fuselage sides.

News in Brief

THE Royal Aero Club announced last week that they had received notification from the F.A.I. that the World's Air Speed Record of 991 km/h (616 m.p.h.) established at Littlehampton on September 7th by Group Capt. E. M. Donaldson, D.S.O., A.F.C., in a Gloster Meteor IV (two Rolls-Royce Derwent engines) had been homologated.

* * *

Under an agreement similar to others existing between the U.S. and several South American Republics, the U.S.A.A.F. is to send a mission to Peru to train men of the Peruvian Air Corps. The agreement lasts for four years.

* * *

Doubled sales, as well as many expressions of appreciation from customers are reported to have followed the first six months' operation of a quick service and repair system by air introduced by G. Brady & Co., Ltd., Manchester. Two more light aircraft are now on order.

* * *

Recent stories of an aluminium shortage were vigorously denied by Mr. Horace Clark, president of the Aluminium Development Association, at a recent informal luncheon at the Dorchester to celebrate Sir Edwin Plowden's knighthood. The only shortage, he said, was a local labour shortage; there were adequate supplies of their base metal, and in this they were more fortunate than other metal industries.

* * *

An 18-hole golf course at La Paz, Bolivia, which is 13,000ft above sea level, has become a popular resort with American commercial pilots operating in that locality. It is claimed to be the highest course in the world and is devoid of grass or other vegetation.

* * *

The Oil and Gas Power Division of the American Society of Mechanical Engineers is to compile a gas turbine bibliography, and its co-ordinating committee is now busy gathering the necessary information and suggestions from members so that it may have a procedure outlined in readiness for its December meeting.

* * *

Picturesque native Indian fairs at such places as Otavalo and Ambato, in Ecuador, are being publicized by Pan American-Grace Airways to attract air tourists to South America.

* * *

A new Dunlop company—Dunlop Special Products, Ltd.—has now begun activity in the manufacture of new materials allied to the rubber industry, such as adhesives, cements, fabric coatings, and flexible plastic products.

AIRSTRIP . . . No. 35

High-speed Airflow

A Critical Review of German Research Methods, Equipment and Results

By R. SMELT, M.A., A.F.R.Ae.S.

A MOST interesting paper was read before the Royal Aeronautical Society on October 9th by Mr. R. Smelt, who is head of the Supersonic Division of the Royal Aircraft Establishment at Farnborough, dealing with German research on high-speed airflow.

Mr. Smelt recalled that the greatest contribution to high-speed research was made by the D.V.L. (*Deutsche Versuchsanstalt für Luftfahrtforschung*) and the twin organizations of K.W.I. (*Kaiser Wilhelm Institut*) and A.V.A. (*Aerodynamische Versuchsanstalt*) at Göttingen. A third station, the L.F.A. (*Luftfahrtforschungsanstalt Herman Göring*), near Brunswick, elaborately camouflaged, had not got really started until 1942, and had thus contributed less than the older institutions. The work on supersonic flow during design of V-weapons done by the Peenemünde group was directed by the Army and not by the Air Ministry, but had considerable importance in its application to high-speed aircraft of the future.

The characteristics of the more important German high-speed tunnels are given in the table. The lecturer remarked that their 2.8 m tunnels gave a Reynolds Number of about 7 millions at high Mach Numbers, compared with British 1 to 2 million, but that the Germans did a ridiculously small amount of full-scale flight research. Uncertainties in the correction for tunnel wall constraints near the speed of sound, and in the effects of wind tunnel turbulence on shock formations, made it imperative to have continual checks with the behaviour of aircraft in free flight.

German subsonic wind tunnels were in general very efficient. This was achieved by making a long expansion from the end of the working section to the first corner. That made the tunnels long and costly. Some interesting work on the effect of Reynolds Number on flow with shock around an aerofoil was done by Dr. Göthert in the 9ft tunnel of the D.V.L. He found that pressure distribution in the region of the shock wave on the aerofoil was much changed with Reynolds Number. The pressure gradients near the shock became greater as R.N. increased and finally settled down to a very steep gradient, more or less independent of R.N., above about 5 or 6 million.

German supersonic wind tunnels were almost without exception intermittently operated by evacuating a container, usually spherical, and drawing in air from the atmosphere through the working section. Evacuating plant of sufficient power to exhaust the reservoir in a few minutes was used. The most interesting innovation was

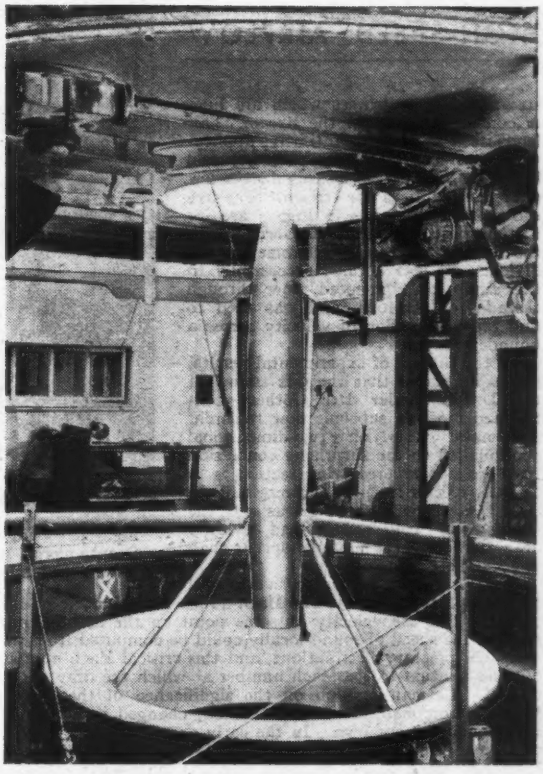


Fig. 1. Working section of vertical wind tunnel A9a. A ram-jet model is mounted for test.

that of a second throat following the working section, made variable in area by a series of screw jacks operating on flexible walls (Fig. 2). In the closed supersonic tunnels its aim was to improve the efficiency by diffusing to a Mach Number not greatly in excess of unity before the final shock wave in the tunnel.

The most notable feature of German high-speed tunnel equipment was the introduction of the Mach interferometer as a method of examining the velocity field around the model. The principle was that diffraction fringes were obtained by the interference of two light beams, one of which passed through the tunnel airstream, while the other went around it. Changes in the density of the airstream, produced by the presence of the model, resulted in displacement of the fringes, the displacement being proportional to the density change. A typical interference pattern, together with a simultaneous schlieren photograph, is shown in Fig. 3. If the interferometer mirrors are set exactly parallel, so that the undisturbed stream produces no interference fringes, then the disturbance due to the model in the

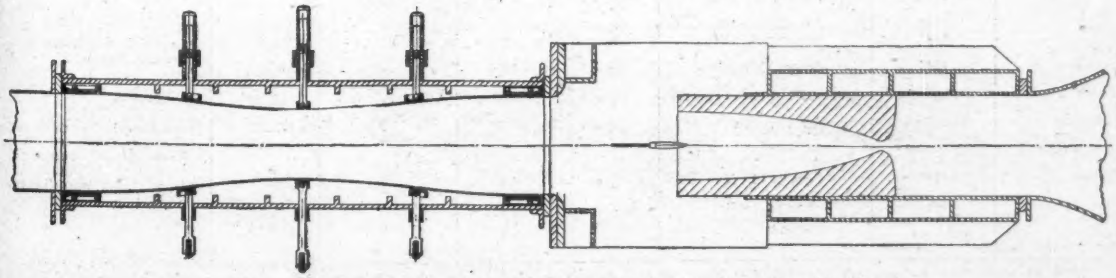


Fig. 2. The supersonic wind tunnel at Kochel, showing adjustable throat.

HIGH-SPEED AIRFLOW

stream produces fringes which are lines of constant density in the stream. This lends itself to direct quantitative application, provided that the pressure, and hence the density, is measured at a few reference points in the stream. The five spots on the pictures in Fig. 3 are for this purpose. Opinion in Germany on the utility of the interferometer was divided. It was applied successfully to the study of high-speed flow through cascades of aerofoils, and was used to find the distribution of velocity across a boundary layer.

On the subject of experimental results, the paper stated that the 9-ft tunnel of the D.V.L. under Dr. Göthert contributed most to subsonic flow research. Systematic tests on two-dimensional aerofoils led to the surprising conclusion that the uncambered wing section is to be preferred for high-speed aircraft. Even at lift coefficients as high as 0.6 the symmetrical wing section had a lower drag at the highest subsonic speeds than any cambered section.

Another important point was disclosed by German experiments: The Mach number at which the velocity at some point on the aerofoil just reached the speed of sound locally could be computed from the measured pressure distributions, and this critical Mach number bore no relation to the Mach number at which the drag began to rise. German opinion on the significance of the critical Mach number had, the lecturer stated, changed in a manner very similar to our own. In the early days of compressibility problems, the critical Mach number—usually deduced from low-speed wind tunnel pressure measurements—was regarded as the upper boundary of permissible flight speeds. A second phase, after some experiments had shown no ill-effects at Mach numbers rather above the critical, was to assume that they appeared at a Mach number above the critical value but related to it.

The third courageous step of declaring the critical Mach number of little significance, was taken only very recently. It had one important corollary: although it is possible to design wing sections with minimum excess velocities on the surface, i.e., maximum critical Mach number, these will not necessarily be better than conventional wing sections. Both in England and in Germany experiments had confirmed that there was, in fact, little to choose between the two types of wing section.

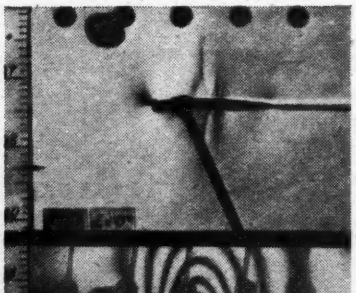


Fig. 3. Combined schlieren-interference picture of an aerofoil at Mach number 0.83.

The most interesting part of Mr. Smelt's paper was that which dealt with German research on swept-back wings and wings of very low aspect ratio. We therefore quote this section of the paper almost *in extenso*.

Of far greater importance than the German work on wing sections is their recognition and development of swept-back or swept-forward wings to delay and reduce compressibility effects. The idea originated with Prof. Busemann of L.F.A., who mentioned its possible application to supersonic flight at the Volta High-Speed Congress in 1935. Apparently its application to delaying the formation of a shock-wave at subsonic speeds was put forward by Prof. Betz at Göttingen in about 1939, and since that date very many tests have demonstrated the soundness of the idea.

The principle is usually explained by considering a yawed aerofoil of constant chord and infinite span, the chord making an angle ϕ with the wind direction. Of the velocity components $V \cos \phi$ and $V \sin \phi$ along and perpendicular to the wing chord, the second, a constant velocity along the span, can have no influence on the flow and pressure distribution around the aerofoil, apart from minor effects in the boundary layer. It follows that the aerofoil behaves, from the shock-stalling point of view, as though the Mach number were not M, but $M \cos \phi$. It is easy to show that the effect of sweep-back or sweep-forward on lift and drag (apart from skin friction), in this idealised case, is as follows: if the unyawed wing has coefficients C_L, C_D at Mach number M, then the yawed wing will have coefficients $C_L \cos^2 \phi$, $C_D \cos^2 \phi$ at Mach number $M/\cos \phi$. Thus sweep-back not only delays the Mach number at which compressibility effects appear, to a value greater in the ratio $\sec \phi$ to 1; but it also reduces considerably the rise in drag in the shock-stalled condition.

This is an idealized condition, and in practice by sweeping back (or forward) the wings of normal aircraft it is not possible to obtain the full gain; as a general rule, the delay in Mach number before the drag rises is only some 50 per cent of the theoretical amount. The German way of expressing this was to say that sweep-back increased the Mach number at which drag rises, from M to $M\sqrt{\sec \phi}$. Even this partial gain is well worth while, however, as can be seen from Figs. 4 and 5. The first figure refers to a proposal to sweep-back the wings of the jet-propelled Me.262 fighter, a modification which was in hand when the war ended. Fig. 5 shows that the fall in slope of the lift curve, characteristic of the shock-stall, is also delayed in the same manner as the drag rise.

CHARACTERISTICS OF SOME GERMAN HIGH-SPEED WIND TUNNELS

Location	Date of first running	Dimensions	Open or closed	Maximum Mach number	Working section stagnation pressure (approx.) (atmosphere)	Available power (H.P.)	Remarks
D.V.L., Berlin ...	1939	Circular, 9ft dia	Closed	1.0*	1.0	17,500	See Fig 1.
A.V.A., Göttingen	1941	Square, 2.6×2.6ft	Closed	1.0*	1.0	Injector	Operated by steam injector.
	1939	Circular, 8.5in dia	Open	1.0*	1.0	Intermittent	
	Pre-war	Rectangular, 4.3×5.1in	Open	3.0	1.0	"	
	1945	Square, 8.5×8.5in	Open	3.0	1.0	"	
L.F.A., Volkenrode	1942	Circular, 9ft dia	Closed	1.0*	1.0	16,000	
	1940	Square, 16×16in	Closed	3	1.0	Intermittent	No drier for entering air (Fig. 3).
	1940	Square, 10×10in	Closed	4	0.08 to 1.0	1,350	(Fig. 3).
	1943	Circular, 40in dia	Open	1.05	0.1 to 1.0	16,000	Operated by centrifugal compressor (Figs. 4, 5).
	1945	Square, 37×37in	Closed	1.8	0.1 to 1.0	16,000	
Munich	Being built	Square, 9ft, rounded corners	Closed	1.0*	0.1 to 1.0	16,000	Flexible walls.
St. Otztal ...	Being built (started 1942)	Circular, 26ft dia	Closed	1.0*	1.0	100,000	Interchangeable working sections for aircraft and power plant tests. Operated by water turbines (Fig. 2).
Kochel	1940	Square, 16×16in	Open	4.4	1.0	Intermittent	Two of these were in use (Figs. 6, 7).
	1940	Square, 7×7in	Half open	3.3	1.0	1,100	
	Construction started	Square, 40×40in	Open	10	—	80,000	

* A maximum Mach number of 1.0 indicates that sufficient power is available to reach choking speeds with a model in position. The maximum Mach number at which significant results can be obtained with a typical model is then about 0.85.

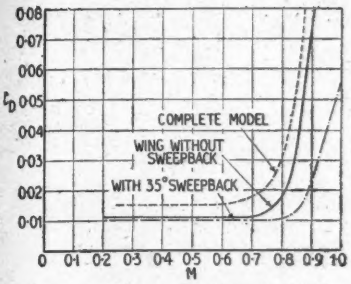


Fig. 4. High-speed tunnel results on Me. 262 model.

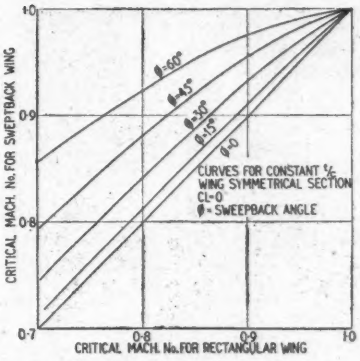

CRITICAL MACH No. FOR SWEPTBACK WING
CRITICAL MACH No. FOR RECTANGULAR WING
CURVES FOR CONSTANT t/c WING SYMMETRICAL SECTION CL=0
Φ = SWEEPBACK ANGLE

Fig. 6. Critical Mach number at centre-line of a V wing.

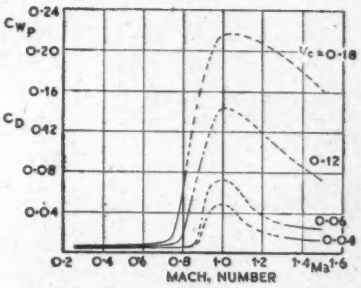


Fig. 7. Drag coefficients of different profiles.

The reason why the gain is only partial lies in the differences between the swept back conventional wing and the idealized infinite yawed aerofoil, *i.e.*, in the wing taper, the finite aspect ratio, and the presence of a central plane of symmetry or a fuselage. Of these, the last is apparently of most importance; clearly, the centre-section of a swept-back wing must act as an unyawed aerofoil, and will develop a shock-wave before the rest of the wing. This has been observed to happen in German wind tunnels; a short-span shock-wave appears first at the centre-section, and spreads gradually spanwise as the Mach number increases. There was much talk of shaping the fuselage sides to be a streamline of the yawed aerofoil flow, but apart from some very empirical attempts at Göttingen to shape an engine nacelle for a swept-back wing, which appear fairly successful, little was done to confirm this possibility. At the end of the war, a more rational approach to the problem was made by Ludwieg at Göttingen, who calculated the critical Mach number at the centre-section of a V wing of infinite span. His conclusions are reproduced in Fig 6, which demonstrates that although the centre-section is not swept back, there is a pronounced favourable effect on its high-speed characteristics from the sweep-back of the rest of the wing. It will be observed, however, that although the simple theory of the infinite yawed aerofoil leads to the possibility of achieving supersonic speeds without a shock-wave, this possibility vanishes as soon as the more practical V wing is considered.

The advantages of sweep-back at high speeds are accompanied by some disadvantages at low speeds and high lift coefficients. Maximum lift coefficient, without flaps, is not greatly changed by sweep-back, although it occurs at a higher incidence; but flaps appear to be very much less effective on a swept-back wing. Slots are also comparatively ineffective:—

		Normal wing (Me.262)	Swept-back 35°
$C_{L\max}$ without flap,	$R=10^6$	0.9	0.9
	$R=3\times10^6$	1.3	1.2
$\Delta C_{L\max}$ due to 50° flap, 0.25 chord		1.3	0.45
$\Delta C_{L\max}$ due to *LE* slot, 0.15 chord		0.6	0.3

Considerable work was in progress in Germany on this aspect of the swept-back wing, and a special nose-flap, which hinged forward from the leading edge at an angle of 60 deg to the chord line, was developed at Göttingen to restore the maximum lift coefficient.

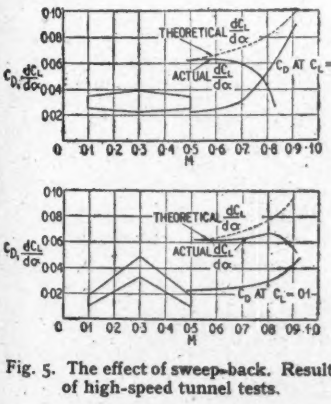


Fig. 5. The effect of sweep-back. Results of high-speed tunnel tests.

The danger of a wing-tip stall, and consequent wing-dropping, with swept-back wings, is, of course, well known from experience with tailless aircraft designs. To avoid it, aircraft designs with swept-forward wings are feasible; from the high-speed aspect, the simple explanation above indicates that sweep-forward is as good as sweep-back in delaying compressibility effects. Indeed, the Germans built a bomber, the Ju. 287, with swept-forward wings; it was jet-propelled and intended for very high speeds. The prototype flew satisfactorily, but was destroyed by the Allies.

It should be mentioned here that the delay of compressibility effects by sweep-back is only one of two possible methods investigated in Germany. A similar delay is possible by reduction of the wing aspect ratio to very small values. As this idea is more appropriate to flight a ssupersonic speeds, however, it will be discussed in detail in a subsequent paragraph.

Work was done both at L.F.A. and at Göttingen on the effects of suction applied on an aerofoil at high speeds, through a slot behind the shock-wave at about 0.7 C. With the best slot position a maximum delay in the drag rise of about 0.1 in Mach number could be obtained; the flow required was given roughly by C_Q = flow / V × wing area = 0.004. This means a flow of 600-800 cu.ft./sec for a typical small fighter, which is quite a large amount, of the same magnitude as the flow demandeu by typical jet propulsion units.

Although it is a difficult practical proposition to apply suc tion in this manner along the whole span of an aircraft, the results may have considerable utility in the delay of local compressibility effects at points such as wing-body or wing-nacelle junctions; particularly if the wing sweep-back promotes early shock-stalling here.

(To be concluded next week)

THE PATHFINDER ASSOCIATION

APPROXIMATELY 400 positions at salaries ranging from £250 to over £1,000 a year have been found by the Pathfinder Association, Ltd., for its ex-R.A.F. members since the inception of the organization. This was mentioned by Dr. J. C. MacGown, D.F.C., when he presided at the annual general meeting held in the club premises at 115, Mount Street, London, W.1, at the end of last month. The employment bureau, he said, formed one of the most important sections of the organization, and over 1,000 letters a month were received and answered by that department alone, besides innumerable telephone calls.

Dr. MacGown said that the Association's financial position was very sound; it had total assets to the value of £6,000, creditors were virtually nil, and some 2,000 of the just over 3,000 members had already paid up their 1946-47 subscriptions by the end of the subscription period on August 15th, which was "very encouraging."

Air Vice-Marshal D. C. T. Bennett, C.B., C.B.E., D.S.O., formerly president of the Association, was unanimously elected its Patron, and Dr. MacGown was elected president with Grp. Capt. D E. F. C. Dean, D.S.O., D.F.C., vice-president. A unanimous vote of thanks was passed to the capable and energetic secretary, Flt. Lt. G. A. Thorne, D.S.O., D.F.C.

FORTHCOMING EVENTS

Oct. 22nd.—R.Ae.S. Belfast Branch: "Flying Experiences," Capt. R. C. Parker, B.O.A.C.

Oct. 25th.—Reunion, 121 Wing, R.A.F. (details and tickets from F. B. Berry, 11 Bush Hill Road, London, N.21).

Oct. 30th.—R.Ae.S. London: Application of the Wind Tunnel to Aircraft Design," Mr. E. Richards (Vickers-Armstrongs, Weybridge).

Nov. 2nd.—Reunion 205 Group, R.A.F., in London (details later).

Nov. 6th.—R.Ae.S. Reading branch: film loaned by High Duty Alloys Ltd.

Nov. 9th.—Helicopter Association of Great Britain: "Helicopter Research and Development," Mr. C. G. Pullin; Manson Houxe, 26, Portland Place, London, W.1.

Nov. 26th.—Society of Instrument Technology; "Aircraft Instrumentation in Test Flying," Mr. C. N. Jaques, Manson House, 26, Portland Place, London, W.1.

The Morane-Saulnier 571

Another French Private-owner Type : Folding Wings and Tricycle Undercarriage

Unusual in modern aircraft, the wings of the 571 are arranged to fold. Since the overall height in the folded condition is likely to be considerable, however, it is doubtful whether this capacity will be much used by the private owner.

AS readers will have gathered from a recent article, a healthy future of French aviation is the considerable activity centred around civil aircraft construction—particularly of types in the private-owner or charter flying categories. Several of the new types, too, show refreshing originality, and none more so than the M.S.560, 570 and 571 low-wing monoplanes produced by the Morane-Saulnier concern. These are constructed entirely of metal, have a tricycle undercarriage and folding wings. The M.S.560 is a single-seater and the two-seater 570 is being replaced by the latest in the series—the two/four-seater M.S.571.

Despite the structural similarity of all three aircraft, the 571 shows a vast improvement on the 570. The appearance has been improved by lengthening the undercarriage legs, and by redesigning the fuselage, tail unit and the sliding canopy. whilst the performance loss is negligible despite a much greater all-up weight. First importance has been given, during design and development, to considerations of cost reduction, safety and comfort, yet despite these conservative factors it is a very advanced aircraft in its class.

In the matter of price, Morane-Saulnier are keeping costs down by adopting methods favoured by car manufacturers—including the extensive use of forgings and castings, pressed sheet-metal sections, electric welding of assemblies and a moving production line. Interchangeability and simplicity of components and parts, embodied on all French light aircraft because of Ministry direction, are included as a matter of course. Design has been calculated to give stability and safe rather than lively flying characteristics. Items of equipment which Morane-Saulnier consider essential to secure all-weather operation are a full set of blind-flying instruments and an R/T set for the receipt of the met. information, whether the set will include a transmitter is not made clear.

Normal accommodation is for a pilot and one passenger in the front side-by-side seats, with a second passenger placed in the centre at the rear, with space for baggage at either side Lockers beneath the instrument panel provide additional stowage for a total of 66 lb of baggage. The entire cabin is enclosed by a deep windshield and a very large transparent plastic sliding canopy giving, in conjunction with the high seating position, a good view in all directions. The only canopy stiffeners are light frames which do not interfere with visibility—but the maintenance of a cool cabin interior in strong sunlight will probably tax the efficiency of the ventilation system. The single rear seat may be replaced by a larger one seating two children or, with a squeeze, two adults. The rear cabin may be used for mailbag or freight stowage, or the aircraft may be laid out as a two- or three-seat trainer.

The fuselage is a duralumin semi-monocoque built in halves and joined along the vertical centre-line, with cut-outs for the centre-section and canopy. Frames, stringers, the firewall, and the tail reinforcing bulkheads are electric-welded to the skin. The tailplane attaches directly to the fuselage at four points and carries the all-metal fin. Movable controls, of metal, are balanced aerodynamically and statically. The wing, built in three sections to facilitate folding, comprises a main torsion box formed by the two spars, intermediate ribs, and top and bottom skinning, with detachable leading-edge and trailing-edge sections.

A good idea of the all-round view provided for the occupants of the 571 is given by this air photograph. The entire canopy slides back. In general lines, as will be seen, the 571 follows modern convention.

DATA AND PERFORMANCE

140 h.p. Renault or Potez L.E.M.

Span	34ft 3in
Length	27ft 11in
Weight empty (three-seater)	1,491lb
Useful load (three-seater)...	827lb
All-up weight (three-seater)	2,318lb
Maximum speed (1,640ft) ...	161.5 m.p.h.
Cruising speed (70 per cent power)	143 m.p.h.
Stalling speed (flaps down at 2,318lb)	50.6 m.p.h.
Absolute ceiling	19,700ft
Range	Over 620 miles.
Fuel	35 gallons

MORANE-SAULNIER 571

The centre-section is offered up into the fuselage cut-out and bolted at four points. Outer top extremities of the front spar carry the wing-fold hinges; the wing locking points being on the lower front spar extremities and the rear spar. Both centre-section leading-edge portions form integral fuel tanks, the port section also including the oil tank. Operating mechanism for the main undercarriage legs is located between the spars although the wheels retract sideways and outwards to be housed within the extension planes. The outer wings hinge directly upwards until the tips nearly touch above the fuselage. Some arrangement whereby the wings lie alongside the fuselage when folded would seem to have been preferable, for vertical storage space reasons, but was perhaps ruled out because of the added mechanical complications and cost.

All-metal flaps, in four sections, are hydraulically operated and are normally used at a 40 deg setting for landing. The ailerons and flaps may be rapidly detached from the main wing torsion box.

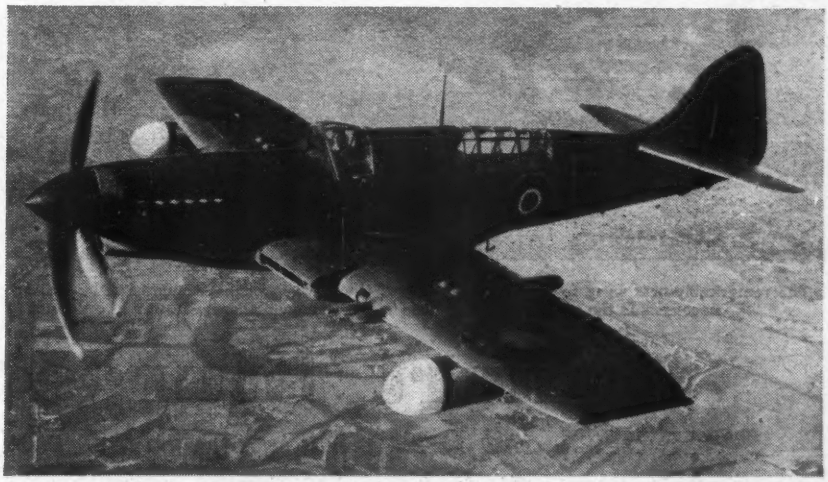
A very neat job has been made of the tricycle gear which, although it has been lengthened in comparison with the 570 to alter the machine's ground angle and provide additional shock-absorber travel, is still low enough to permit an easy step on to the wing. For taxy-ing, the nose-wheel is steerable from the control column, but the wheel may be locked in the correct fore-and-aft position at take-off and before the unit is retracted. Main wheels are partially enclosed in the retracted position by fairing panels attached to the struts, and have brakes operated from extension bars on the rudder pedals.

The power plant is modern, in that it is quickly detachable. Either an air-cooled 140 h.p. Renault 4 Pei or an L.E.M. (Potez) 4 D of similar power is suspended, through rubber shock dampers, on a simple cantilever mounting and drives a variable-pitch airscrew.

Tropical Trials

Gruelling Tests of Griffon-Firefly in Iraq

A FAIREY Firefly IV fighter/reconnaissance aircraft, fitted with a Rolls-Royce Griffon 74 engine, has completed in Iraq a series of tropical trials which are claimed to have exploded the myth that there is difficulty in operating liquid-cooled engines in hot climates.



A Firefly IV with Griffon 74 engine as used for tropical test work in Iraq.

With Group Capt. Slade, of the Fairey Aviation Co. as pilot, the Firefly was flown to Baghdad via Malta, Cairo and Habbaniya. The object of the trip was to demonstrate in practice what had been decided in the design stage—that the Firefly IV and its engine will function satisfactorily at the extremely high temperatures prevailing in Iraq during the hottest summer months.

The most severe test involved prolonged taxying with the Griffon running at 1,200 r.p.m. for about 45 minutes at a temperature of 106 deg F. Officially the Griffon is cleared for a coolant temperature of 125 deg C, with an emergency combat peak of 135 deg C, and in this connection it may be mentioned that the highest ground air temperatures in the world are in the region of 125 deg F (52 deg C). The temperature of the coolant on starting was 69 deg C, and on completion of the test was still within the safety margin. After reaching the highest temperature obtainable under these deliberately freak conditions the aircraft was flown off at maximum r.p.m. (2,750) and 18 lb boost. One minute after becoming airborne the coolant temperature was down to 113 deg C, and by the time the Firefly had climbed to 12,000ft, was 101 deg.

In spite of the climatic conditions excellent performance figures were recorded in flight. The cruising speed, with 7 lb boost at 2,400 r.p.m., flying at 5,000 ft, was 260 m.p.h., and at 17,000ft 289 m.p.h. Temperature control was very good throughout as there was always plenty of latitude with the radiator shutters open and closed.

It is significant that the Firefly was being flown under conditions of maximum load and drag. In addition to two 50-gallon wing-tip tanks the machine was carrying two 90-gallon drop-tanks, providing a total fuel capacity of 426 gallons and raising all-up weight to 14,800 lb.

Some of the tests took the form of a demonstration in the presence of H.R.H. the Prince Regent of Iraq and staff officers of the Royal Iraq Air Force, including Colonel Sami Fattah, Chief of the Iraqi Air Force, and Wing Commander Fisher, Air Adviser to the British Mission. The short take-off and landing characteristics of the Firefly, its excellent manœuvrability and suitability for operation in mountainous country, were displayed.

At Heliopolis more demonstrations were given before Air Vice-Marshal Sir Brian Baker, Deputy Air Officer Commanding in Chief Middle East.

GEOFFREY DE HAVILLAND

EVEN those who knew him well and fully appreciated the importance of his work in aircraft development must have been warmed and impressed by the numbers of all ranks and positions who attended last Thursday's memorial service for the late Mr. Geoffrey de Havilland. The Cathedral at St. Albans was filled to overflowing by members of the British and foreign fighting services and Governments, airlines, the aircraft industry and his own flying and staff colleagues.

In his memory it is proposed to start a fund for a scholarship in aid of the advanced study of aeronautical problems. It is hoped that the R.Ae.S. will administer the fund and that a capital sum of £5,000 will be reached. Donations may be sent to Barclays Bank, Burnt Oak, Edgware, Middlesex. During his last months, one of Mr. de Havilland's interests lay in the possibility of organizing national air races in this country. It would be a fitting unofficial tribute if, in addition, this idea could be developed.

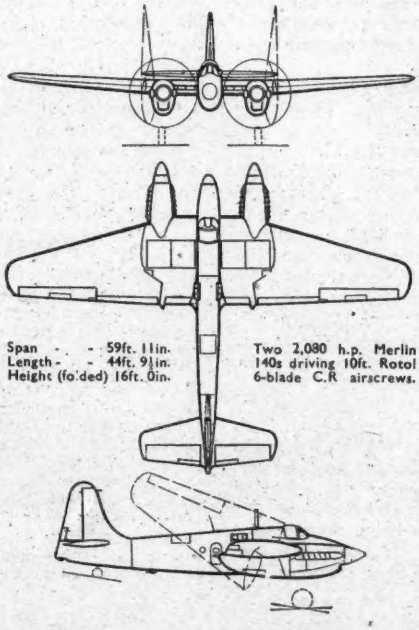
The remarkably neat wing folding arrangement of the Sturgeon can be appreciated here together with the close spacing of the nacelles and the necessity to swing the inner airscrew blades horizontal in order not to exceed a width of 20ft.

Short Sturgeon

Structural and Design Features of New Naval Aviation Twin Reviewed

A NEW naval aircraft is always interesting—if only in affording an example of how to pack a great deal into a limited space. The Short Sturgeon, a machine designed specifically for operation from carriers, naturally reflects the peculiar qualities necessary for such operation. The pilot is given an exceedingly good field of view forward and downward, accelerator and arresting gear is embodied and, in addition, provision is made for R.A.T.O.G. Further, the uni-directional initial shock absorption characteristic built in to the main undercarriage legs enables "drop" landings to be made without sustaining damage.

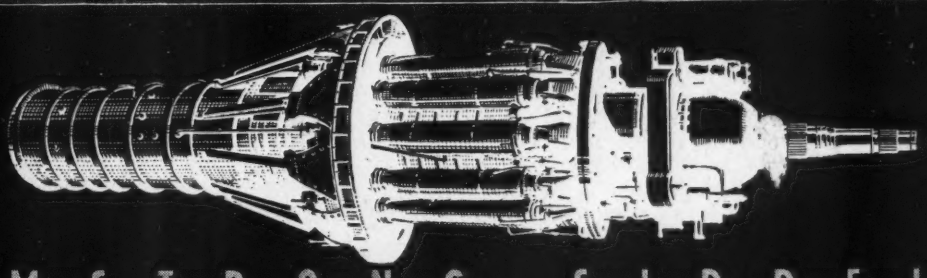
Regarding the Sturgeon from the viewpoint of design analysis, it is at once apparent that the imposed stricture of a 20ft folded width has had its effect in colouring the whole layout concept of the machine. To achieve a folded width of but one-third the normal span would be no mean task even with a single-engined aircraft, but to do this with a twin-engined three-seater is a job of more than ordinary magnitude. Shorts are indeed to be congratulated on the extremely neat solution they have made to a very thorny problem.



To fold a 60ft wing down to 20ft meant that only an oblique hinge-type fold could be used—other types would incur unacceptable penalties. It also meant that the nacelle centres must be as close together as airscrew/fuselage physical and aerodynamic interaction would allow; this in turn called for contra-rotating airscrews as being the only way in which the required solidity factor and thrust area could be obtained within a small disc diameter. It is true that contra-props have the additional advantage of eliminating any tendency to swing—and this is particularly valuable for a carrier aircraft—but, in point of fact, it was chiefly for folded

The structural analysis of the Sturgeon continued on page 423, is here interrupted for a brief discussion—accompanied by illustrations—of operational aspects and Service equipment.

POWER FOR THE PLANES OF TO-MORROW



ARMSTRONG SIDDELEY

PYTHON GAS TURBINES

ARMSTRONG SIDDELEY MOTORS LTD., COVENTRY (BRANCH OF HAWKER SIDDELEY AIRCRAFT CO., LTD.)

SEA AR
FROM
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First Air-to-Photog the Prototype Sturg landing Reconsance Target-towingersion

The surprisingly high performance of the Sturgeon (the estimated maximum speed is 430 m.p.h. at 19,000ft) is due largely to clean aerodynamic design. This is evident in the side view on the left

(Right) M Sturgeon s ample wi a loading the botto are the th cal came ports are photograp age for t the extren is

(Below) A prototype the close s (Merlin 1 from the prerequisi engine de like

MR. GEOFFREY TYSON, in flying the first prototype of the Short Sturgeon I for the *Flight* photographs on these pages, has done more than provide attractive pictures; he has placed the machine to show features which bespeak its purpose.

Readers will already be aware that the Sturgeon is the first twin-engine aircraft to be designed specifically for operation from aircraft carriers; the characteristic close spacing of the Rolls-Royce Merlin 140 engines and the use of contra-rotating Rotol airscrews are the outcome of a Naval requirement that the folded width should not exceed 20ft. The "contra-props", moreover, eliminate swing on take-off—an embarrassing fault which became manifest as the power of deck-landing aircraft increased during the war years.

Careful design, as explained in the structural description on pp. 422 *et seq.*, has permitted an aircraft to be built which combines the tractability in handling, sturdiness, good view, adaptability and performance demanded by Specification S.11/43.

Basically, the Sturgeon is a deck-landing aircraft designed for photographic or visual reconnaissance. With a full complement of three cameras a crew of two is carried, but in the "visual recce." case three men—pilot, observer and W/T operator—are required. Provision is made for an oblique camera but this is not mounted when the vertical cameras are installed.

Bombs or Depth Charges

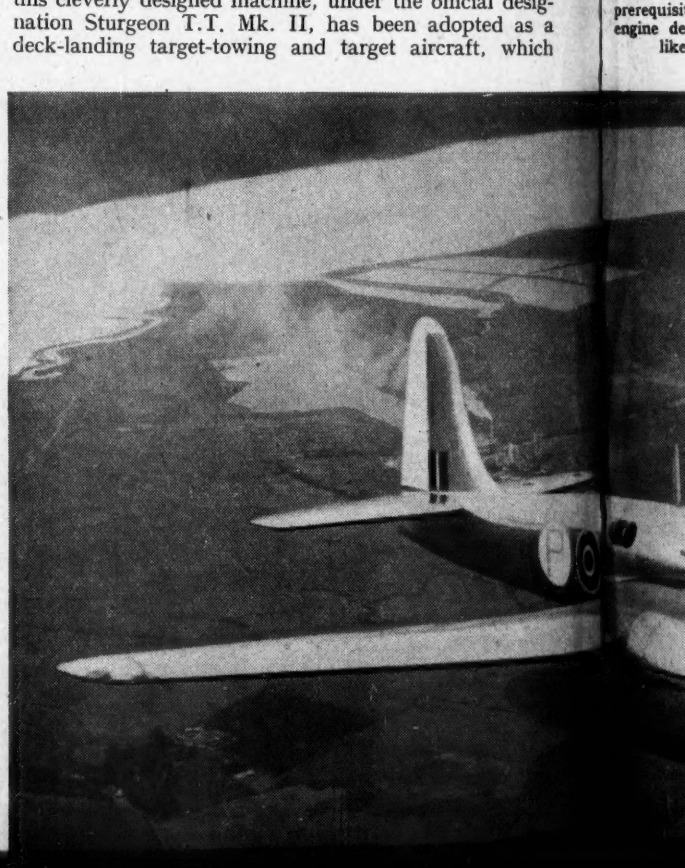
As a bomber the Sturgeon has internal stowage for one bomb of 1,000 lb or two 500 lb bombs. An equivalent load of depth charges is a further possibility, but the Short design staff count themselves fortunate that My Lords of the Admiralty did not see fit to specify torpedo-carrying as an operational role.

Radio and radar to the latest specification can be fitted, including a neat A.S.V. installation in the nose of the fuselage. The armament is two fixed 0.5in Browning guns, likewise in the fuselage nose.

In addition to the power-folding gear, deck-arrester, and accelerator equipment, there is provision for rocket-assisted take-off, utilizing two containers, each with four rocket units, beneath the wing roots.

There seems to be no doubt that Short Bros. have done a thoroughly good job in meeting a stringent specification and it is through no fault of theirs that the Sturgeon will not be placed in service with Naval Aviation as an operational type. The reason for ordering that all production Sturgeons shall be produced as target-towers is doubtless that a faster aircraft is now required for the all-important task of Naval reconnaissance. This need, of course, has become more acute since the development of jet-propelled, deck-landing fighters.

Nevertheless, there is some consolation in the fact that this cleverly designed machine, under the official designation Sturgeon T.T. Mk. II, has been adopted as a deck-landing target-towing and target aircraft, which



AARER RM CHESTER

to-Photographs of pe Sturgeon Deck-econnaissance Aircraft : vingersion Projected

(Right) Mr. Tyson banks the Sturgeon sharply to display the ample wing area, which gives a loading of 38.8 lb/sq ft. In the bottom of the fuselage are the three ports for vertical cameras; supplementary ports are provided for oblique photography. The neat stowage for the arrester hook, in the extreme tail of the fuselage, is also evident.

(Below) An aspect of the first prototype Sturgeon showing the close spacing of the engines (Merlin 140) and the good view from the pilot's cockpit—two prerequisite features in a twin-engine deck-landing machine like the Sturgeon.

should prove of great benefit to Naval anti-aircraft gunnery in that it is a relatively high-speed machine which can travel with the Fleet and operate whenever weather conditions are suitable for flying-off and flying-on.

The target-towing Sturgeon will differ greatly in appearance from the reconnaissance machine, and due to its increased length, the nose of the fuselage has been designed to fold, for stowage on an aircraft carrier.

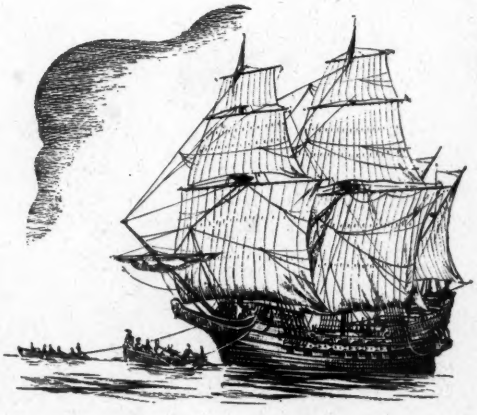
The drogue will be stowed in the bottom of the fuselage and will be operated by a power-driven winch, avoiding the drag of the arm and windmill characteristic of some earlier target-towers. Thus, in spite of the increased fuselage size, the Sturgeon should be the fastest Naval target-towing aircraft in the world and will doubtless prove a valuable addition to the equipment of Naval Aviation.

AVRO TUDOR II

AVRO

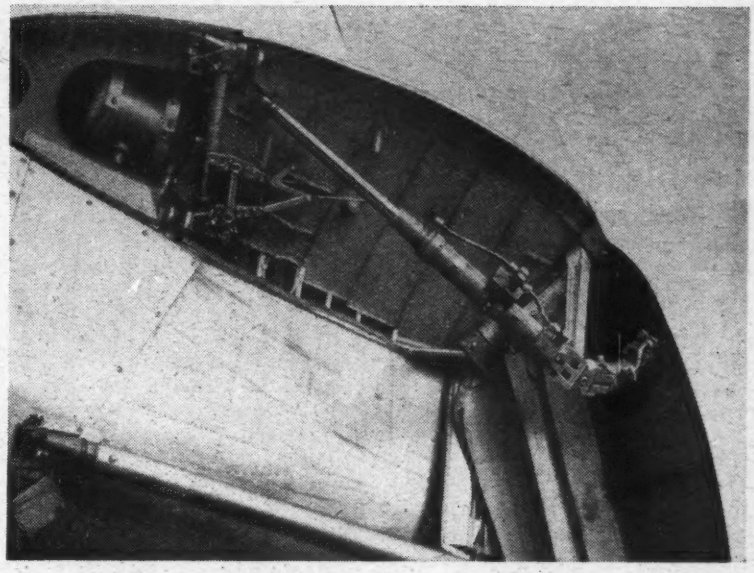
Since Tudor times, Britain has led the world in transportation

In world transportation Britain has long been the acknowledged leader—little ships that in Tudor times circumnavigated the globe—steamships that carried the world's trade—railways, too, almost exclusively British in their development. Air transport follows naturally. Themselves pioneers in aviation Avro well maintain Britain's lead. The Avro Tudor II, in which performance is soundly balanced with reliability, carries 40-60 passengers in luxury comfort over ranges up to 3,000 miles. Fully pressurised and air-conditioned, it has an economical cruising speed of 235 miles an hour and a top speed of well over 300.



A. V. ROE & CO. LTD., MANCHESTER, ENGLAND (Branch of Hawker Siddeley Aircraft Co. Ltd.)

SHORT STURGEON



The arrangement in series of the two hydraulic jacks and their swinging "A" bracket for the large range of folding motion can here be seen.

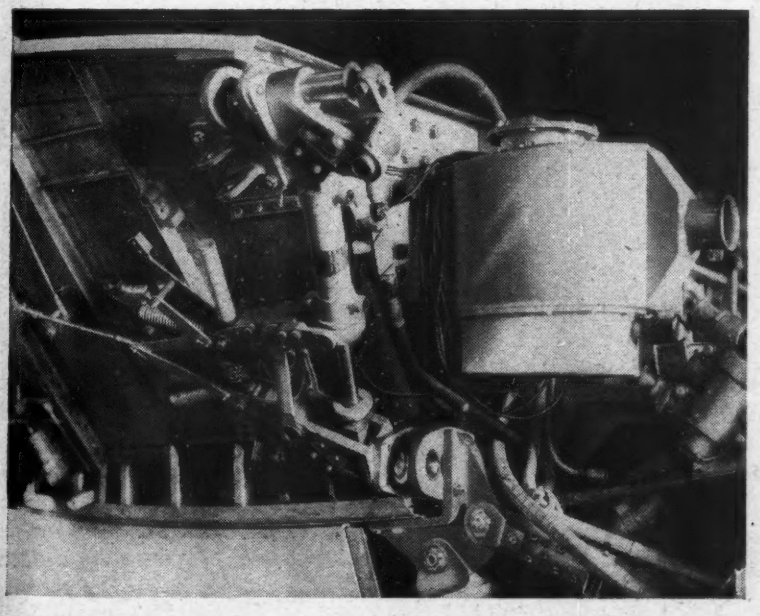
width reasons that they were chosen for the Sturgeon.

Probing further, one can see that the necessity to swing the chordal plane of the wing almost truly vertical, this being the only way in which the width limit could be maintained, meant that the angular range of folding motion had to be large, and it is this factor which brought with it the doubled jacks, swinging jury bracket, etc., which we see used. In addition, it laid down the angular positioning of the hinge axis which, in its turn, decided the angular relationship of the centre section spars and those of the outer wing panels.

The centre section is a fairly conventional "straight-through" type assembly carrying the engines and main undercarriage legs, and containing the fuel tanks between its spars with the ducted radiators for engine cooling arranged in the leading edge. The spars are orthodox members made up of extruded light alloy angle-section booms and plate webs, the front spar being in the vertical plane whilst the rear spar is raked back some 33 deg. This is necessitated by the requirements of hinge axis location, as is the corresponding outward rake of the centre section outboard ribs, the hinge being on the "mitre" at the intersection of rear spar and end rib. Before going on to deal with the folding arrangement and wing structure we may here survey the engine mounting and undercarriage layout.

In order to maintain an unbroken top surface line—and also to keep the undercarriage from being too "gangling," the Sturgeon being a mid-wing aircraft—the Merlin 140s are carried in a braced mounting frame the top pick up points of which attach to the base of the front spar whilst the lower pick ups are anchored to the ends of the undercarriage transverse pivotal member. This is a rather unusual arrangement, but the overhung weight of the power units must impose a somewhat smaller torsional load on the centre section structure than is normally the case.

The undercarriage legs are of "gallows" type, carried on a triangulated bracing structure formed by tubular members anchored to the bases of the spars and joining at a common apex which picks up the top cross member of the "gallows." Single jacks are used for each leg, the jack piston laying parallel beneath the upper half of the breaker strut, with the piston rod pivoted to a toggle linkage for the locking mechanism. It is relevant here to note that the legs are interchangeable port and starboard, and are unusual in their employment of an oil dashpot conjointly with the normal oleo-pneumatic shock absorbers. The dashpot is a uni-directional shock absorber which copes with the initial landing loads and takes up roughly half of the 15in total compression travel, the remaining half being catered for by the oleo-pneumatic shock absorber.



Detail of locking pin actuating gear showing toggle linkage and use of jack itself as a link member.

Folding Arrangement

To get back to the wings, the hinge is a very simple pin-and-socket pivot which also incorporates a swinging jury bracket, or "A" frame, to act as a reaction transmission member for the twin wing-fold jacks. On the ends of the centre section front spar booms are forged fork-end fittings which mate with complementary lug fittings on the inboard ends of the front wing-spar booms, and are secured together by the locking pins. These latter are operated by an ingenious toggle linkage actuated by a small jack which itself forms a toggle arm. Naturally, the lock pin operation is arranged in the appropriate sequence relative to the wing folding operation proper. The main jacks for power folding are also arranged to operate in sequence, that anchored to the centre section extending first and, pushing via the "A" frame against the "solid" wing jack,

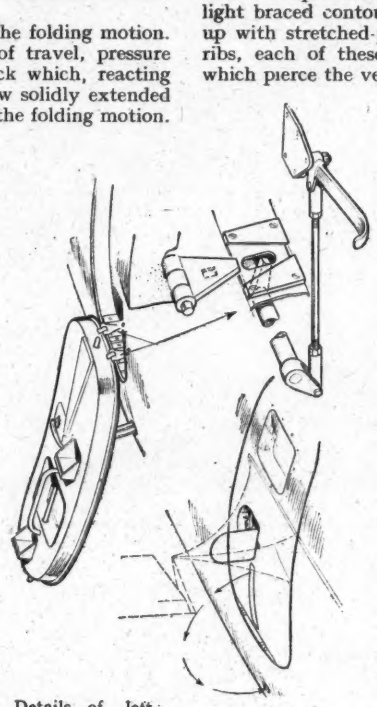
SHORT STURGEON

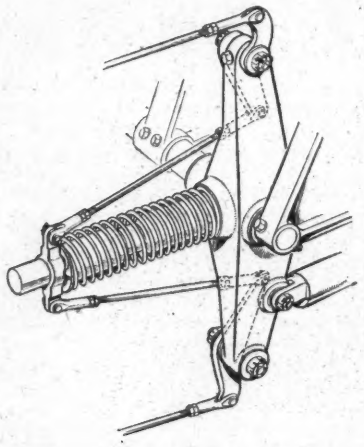
moving the wing through roughly half the folding motion. When this first jack reaches its limit of travel, pressure oil feed is transferred to the second jack which, reacting through the "A" frame against the now solidly extended first jack, accounts for the remainder of the folding motion. An adjustable jury strut, manually fitted, braces the folded wing by engaging an end socket in the undercarriage cross tube and, at its other end, the lug fitting on the top boom of the front wing spar.

Wing structure is fairly orthodox, but the wing leading edge having been swept back whilst the trailing edge is normal to the fuselage axis has had the effect, in conjunction with the wing fold layout, of making the front spar rake about 10 deg from the vertical whilst the rear spar is raked about 33 deg in conformity with its parent member in the centre section. Other than in these respects the structure is quite normal in its composition of diaphragm type interspar ribs and light braced contour members. The leading edge is built up with stretched-pressed skin surfacing on pressed sheet ribs, each of these latter carrying two threaded spigots which pierce the vertical flanges of the spar booms and are secured behind with lock nuts. The trailing edge structure is fabricated with pressed sheet ribs contoured for housing the Zapp split flaps (the roller guides for which are housed between doubled ribs) whilst farther outboard the ribs are recessed for the aileron nose shrouding.

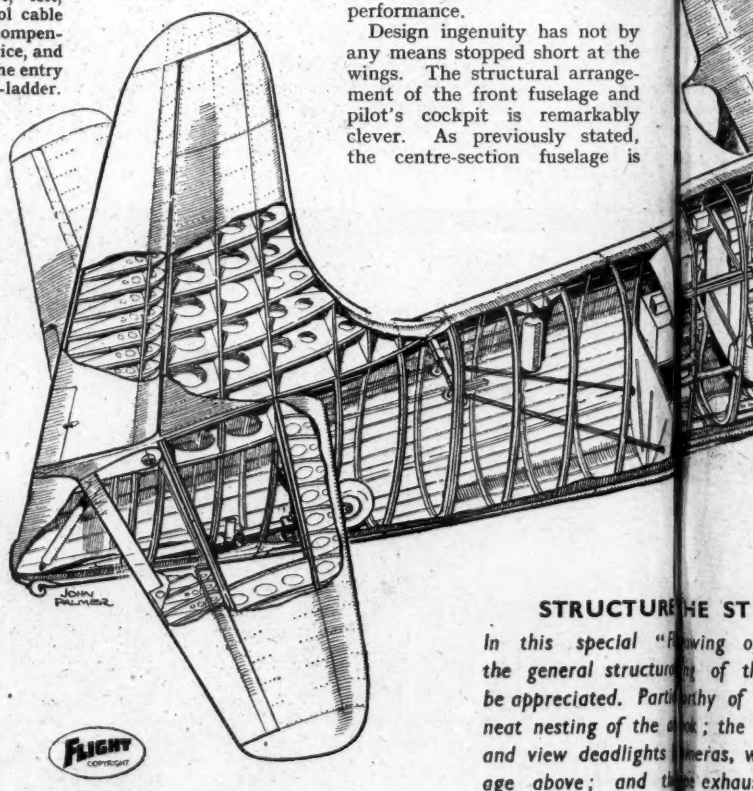
The aerofoil section used is a modified NACA which, with its greatest depth at 40 per cent chord, has a gently reflex-curved trailing contour; that is to say, it is slightly cusped on the upper surface. Skinning is, on the whole, excellent—for the complete machine—but the leading edge of the wing back to the maximum depth station is particularly good. Laminar flow is a phrase that has grown somewhat threadbare with use, but it has an application to the Sturgeon wing despite the fact that the section is not very "thin." However, the use of such an aerofoil together with the general overall cleanliness of the Sturgeon—aerodynamically—and the reasonable power loading are cardinal factors in the aircraft's performance.

Design ingenuity has not by any means stopped short at the wings. The structural arrangement of the front fuselage and pilot's cockpit is remarkably clever. As previously stated, the centre-section fuselage is





Details of, left, the control cable rigging compensation device, and right, of the entry door-cum-ladder.



STURGEON I DATA

Wing area	560.4 sq ft
Aspect ratio	6.4
Aerofoil section	N.A.C.A. 65,2—2.5 modified
S.M.C.	9.354ft
Dihedral	3 deg 45 min
Incidence	2 deg
Wing loading	38.7 lb/sq ft
Power loading	5.22 lb/b.h.p.
Tailplane span	20ft
T/P and elevator area	108.22 sq ft
Elevator area	37.5 sq ft
Fin and rudder are	72.7 sq ft
Rudder area	21 sq ft
Aileron span	11ft 9in each
Aileron area	16.78 sq ft each (aft of hinge)
Flap type	Zapp, split
Area	86.4 sq ft per wing
Gross weight	21,700 lb

Percentage weights:

Structure	36.30	Equipment	12.58
Engines	33.20	Crew	3.08
Tankage	1.82	Fuel and oil	13.02

PERFORMANCE

Take-off power	1,660 b.h.p.
M.E.T.O. power	2,050 b.h.p.
Max all out power	2,080 b.h.p. at 2,000ft
Max cruising power	1,220 b.h.p.
Max climbing power	1,440 b.h.p.
Max all out speed	373 knots T.A.S. at 19,000ft
Max cruising speed	313 knots T.A.S. at 22,000ft
Max climbing speed	343 knots T.A.S. at 24,200ft
S.L. initial R.O.C.	4,150ft/min at 20,000 lb
Absolute ceiling	36,400ft at 20,000 lb
Absolute range (600 gal)	1,450 sea miles
Max range with max payload	900 sea miles

STRUCTURE OF THE ST

In this special "F wing o the general structur of t be appreciated. Parti thy of neat nesting of the ; the and view deadlights eras, w age above; and t exhau

built integrally with the wing centre-section, and immediately forward of the front spar is a raking transport joint. The pilot's controls, instruments, seat, and floor are all built up as a separate unit sub-assembly—rather in the form of a chassis—which is simply bolted at four attachment points to the front spar. The outstanding simplicity and great convenience of this arrangement make it appear odd that it has not been common practice in the past.

Both of the 0.5in Browning guns are mounted in a cast cradle anchored to the doubled frames in the fuselage nose, and their ammunition is housed in a box slung in the roof over the guns with chutes down to the breaches.

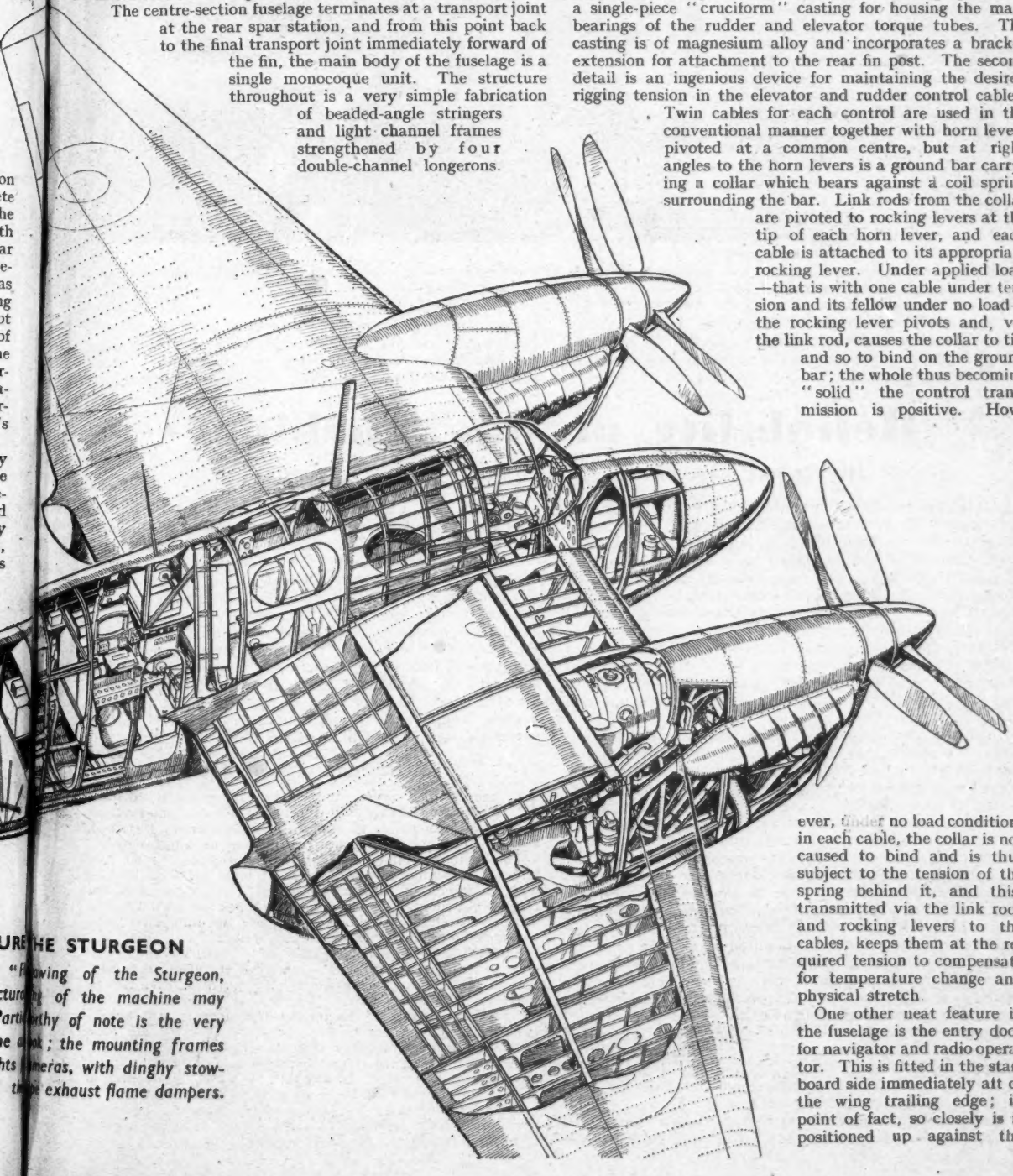
The centre-section fuselage terminates at a transport joint at the rear spar station, and from this point back to the final transport joint immediately forward of the fin, the main body of the fuselage is a single monocoque unit. The structure throughout is a very simple fabrication of beaded-angle stringers and light channel frames strengthened by four double-channel longerons.

The navigator's position is immediately rearward of the wing centre section and he sits facing forward on the port side. Behind his seat the various elements of radio equipment are stowed, and the operator is seated conveniently for access, also on the port side. Mounting for the three cameras is built into the fuselage structure at the rear of the radio operator's station, and the "deadlight" ports for them are fitted in a trough formation which breaks very slightly the "keel" line of the fuselage.

Structurally, the tail surfaces are perfectly conventional, but there are two detail features at this end of the aircraft which are worthy of note. The first is the employment of a single-piece "cruciform" casting for housing the main bearings of the rudder and elevator torque tubes. The casting is of magnesium alloy and incorporates a bracket extension for attachment to the rear fin post. The second detail is an ingenious device for maintaining the desired rigging tension in the elevator and rudder control cables.

Twin cables for each control are used in the conventional manner together with horn levers pivoted at a common centre, but at right angles to the horn levers is a ground bar carrying a collar which bears against a coil spring surrounding the bar. Link rods from the collar are pivoted to rocking levers at the tip of each horn lever, and each cable is attached to its appropriate rocking lever. Under applied load—that is with one cable under tension and its fellow under no load—the rocking lever pivots and, via the link rod, causes the collar to tilt and so to bind on the ground bar; the whole thus becoming "solid" the control transmission is positive. However, under no load condition, in each cable, the collar is not caused to bind and is thus subject to the tension of the spring behind it, and this, transmitted via the link rods and rocking levers to the cables, keeps them at the required tension to compensate for temperature change and physical stretch.

One other neat feature in the fuselage is the entry door for navigator and radio operator. This is fitted in the starboard side immediately aft of the wing trailing edge; in point of fact, so closely is it positioned up against the

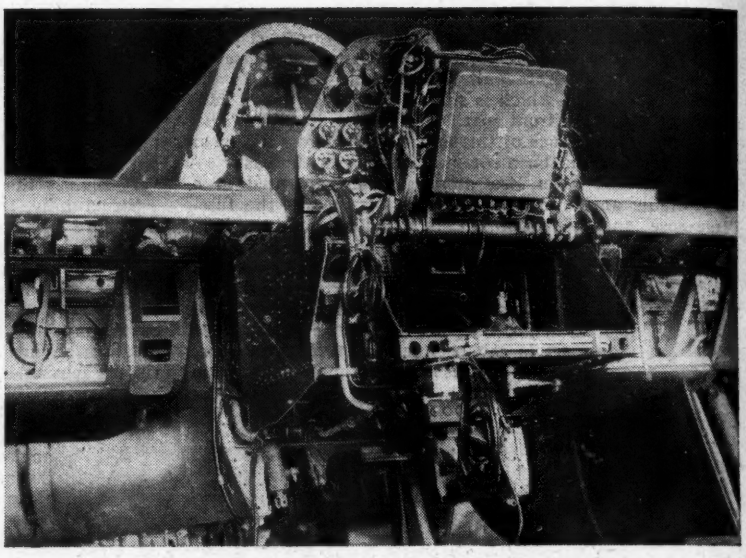


THE STURGEON

"...wing of the Sturgeon, ...of the machine may ...thy of note is the very ...; the mounting frames ...eras, with dinghy stow... ...exhaust flame dampers.

SHORT STURGEON

wing that the root fillet is faired off by a trailing portion attached to the door itself. Hinging is at the bottom so that the door opens outward and downward, and an ingenious feature is the provision of a hinged arm which, as the door swings down, automatically emerges from a recess to engage an air-piston snubber and so prevent the door from damage. It also acts as a jury strut when the door is being used as an access ladder, for which purpose toe-recesses are provided in the inner surface. Jettison requirements are also cleverly arranged. The hinges are carried on wedge blocks which fit into appropriate slots in the threshold, and are held in position by spigots projecting up through the slots and engaging recesses in the underside of the wedge blocks. These spigots are mounted on a shaft which, by a linkage inside the fuselage can be turned to jettison the door: in this case the spigots force the wedges out of the slots and the door falls away.



The cockpit unit sub-assembly is built as a chassis and bolted up to the centre-section front spar at four points.

As at an all-up weight of 19,000 lb, with a 27-knot wind, the unstick distance under engines alone is but 65 yards, with rocket assistance the Sturgeon should become airborne in an exceedingly short distance indeed. Arresting is catered for by a neatly faired hook which, in addition to incorporating a snubber to prevent bouncing along the deck and missing the wires, is fitted with a shock absorber to preclude rebounding and damaging the rudder.

Reliability of Gas Turbines

Increased Overhaul Life of the R.R. Derwent I

ALTHOUGH outstanding mechanical reliability is frequently mentioned among qualities to be expected from gas turbines there has been but little evidence other than accumulated running hours for a number of engines, to indicate that by comparison with the orthodox piston engine particular progress has been made in this connection. The importance of reliability tends to be overlooked in the face of often-repeated claims for performance, and from the operator's point of view reliability is of even greater importance than the other well-known advantages associated with the gas turbine, namely, speed, lightness and simplicity. Precise information on the vital question of reliability has been noticeably restrained.

In this connection a recent announcement by the Rolls-Royce Company that they have completed over 20,000 hours of gas turbine test running, and that a single Derwent I turbo jet has successfully completed a thousand hours of test running, will be of great interest to engineers and operators. It is claimed that as yet no other jet engine in the world has approached this achievement.

The particular Series I Derwent was originally assembled in June, 1944, and in the intervening period to date has completed a total running time on the test beds of 1,005 hours. At least 920 hours of this period of test development was run at full type test conditions. At the end of the first 500 hours replacements required were a set of flame tubes, one air casing, some turbine blades, and a fuel pump. Major components of the engines which had completed over 850 hours running and are still in use are the wheel case with accessory drives, the compressor impeller and shafts, the compressor casing, diffuser, and combustion chambers. In being used as a slave engine for modification of approval tests under type test conditions, it can be said that this engine has been put through unusually rigorous tests.

As a result of the satisfactory strip examination of six Derwent units returned by the R.A.F. after having completed the official running period of 180 hours, the overhaul life of the Derwent I has recently been increased to 270 hours. The condition of all six engines is said to have been excellent and there are indications that they had had a much easier time in service than when being tested for 100 hours under type test conditions. It is stated that as the gas turbine is still a comparatively new venture a cautious approach is being made by the Air Ministry to the question of extending the period between overhauls. The present practice is to increase the overhaul period in stages of 90 hours, and the Rolls-Royce Company confidently expect that as soon as the requisite number of engines complete their 270 hours' service life a further extension of 90 hours will be granted for the Derwent I.

NEW TRIPLEX GLASS

BY the use of a new synthetic material known as Vinal—it is actually Polyvinyl Butyral—the Triplex Safety Glass Company are now able to produce laminated safety glass with a break-resistance three times that of their previous product.

The laminated safety glass which has been used up till now is built in laminæ of outer sheets of plain glass sandwiched with an interlayer of cellulose acetate. This gives excellent results, but the new development makes possible a glass with a 300 per cent increase in break-resistance for unimpaired light transmission and without increase in weight.

Since Vinal has far better qualities of elasticity and resistance to tearing than cellulose acetate, safety glass made with it is able to maintain a pressure cabin differential, even though the glass may be fractured. Further, at temperatures down as low as −80 deg C the impact resistance is still largely maintained. Light transmission of Vinal is extremely good compared with the acetate interlayer previously used. In the case of the normal interlayer thickness of 0.015in light transmission is 86 per cent, but even with a Vinal thickness of 0.125in the transmission decreases only to 84 per cent.

The vastly increased break-resistance of the new glass would appear to offer a means of reducing weight since, for a given breaking factor, a thinner panel may be employed.

PARISIAN TERMINAL: In spite of the damage suffered during the later years of the war, Le Bourget is rapidly returning to its pre-war appearance. Apart from the work which has been done on the terminal building, shown here, new runways are being laid down.

'Flight" photograph.

U.K. Internal Services: Improved Constellation Performance: Cheaper Atlantic Crossing

CIVIL AVIATION NEWS

ANOTHER VIKING TOUR

FEELING that there is a considerable aircraft market potential in South Africa and over the Near East, Vickers-Armstrongs are shortly sending out a Viking to cover the area on a goodwill and demonstration tour. The machine will leave this country on October 28th and will fly via Egypt, the Sudan, Kenya, Rhodesia, Portuguese East Africa and the Union of South Africa, afterwards returning to Europe, via Algiers, starting on December 5th.

Significantly enough, the aircraft will carry, in addition to its normal demonstration crew, Sir Ronald Weeks, deputy-chairman of Vickers, and Maj H. R. Kilner, deputy-chairman of Vickers-Armstrongs. Lt. Gen. Sir Ronald Weeks was, of course, deputy Chief of Staff during the war. The demonstration pilot will be Wing Cdr. A. D. MacN. Boyd, D.S.O., D.F.C., and the Vickers-Armstrongs sales manager, Wing Cdr. Maurice Summers, is also making the round trip, so it is all very much in the grand tour style and should produce some good results. It may be remembered that Air Comdre. Fielden, who is in charge of the King's Flight, has recently been flying a Viking over much of the South African area in preparation for the Royal visit next year.

K.L.M.'s NEW ATLANTIC ROUTE

AFTER considerable deliberation, study of statistics, and several test flights, K.L.M. have chosen the mid-Atlantic route for their service to the United States. From Amsterdam the Constellations will fly to Santa Maria in the Azores, and from there to Sydney, in Nova Scotia, and then on to La Guardia, New York. By using Sydney instead of Gander it is hoped to avoid the fog belt and so obtain safer and more regular and punctual services.

The DC-4s which have been flying from Prestwick to New York will be diverted for use on the K.L.M. service in Europe, to Africa and South America. There will be a connection between London and Amsterdam for the trans-Atlantic crossing, which will be run at a frequency of three a week.

B.E.A. WINTER SCHEDULES

BRITISH EUROPEAN AIRWAYS have announced winter schedules for operation on the internal services in the United Kingdom. The services will be operated on a three-monthly agreement by their former private owners until the English and Scottish Divisions of the Corporation are formed. D.H. Rapides still predominate on most of the services, but Scottish Airways are using Dakotas on the Glasgow-Belfast and Glasgow-London routes, and Scottish Aviation on the Prestwick-Belfast route. Railway Air Services are flying Avro 19s between London and Belfast, and Channel Islands Airways are flying a Wayfarer service between Jersey and London.

The North-West of England, Northern Ireland, the Hebrides, Orkneys, Shetlands, and the Channel Islands are all well served, but there is a very obvious shortage of air connections up the North-East Coast, and also to Cornwall and South Wales. These will probably come in time when more aircraft are available and the airfield situation has been cleared up.

It is understood that B.E.A. have ordered two Concordia aircraft from Cunliffe-Owen, which will be used for radio research and development flying. It is possible that a small proportion order will be placed for some of these aircraft for use on certain internal air routes. The Concordia, it will be remembered, is a 10- to 12-seater, suitable for feeder services. As part of the B.E.A. plan for future Continental services, it is the intention of the Corporation to replace eventually the Vikings with Vickers VC-2s. The VC-2 is a 32-seater with tricycle undercarriage, and powered by four Rolls-Royce airscrew turbine "Dart" engines. The cruising speed is in the neighbourhood of 330 m.p.h.

DIRECT INJECTION CONSTELLATION

PAN AMERICAN WORLD AIRWAYS have started using Constellations with the new direct injection engines in regular service on the trans-Atlantic and Pacific routes. The programme for conversion to the new system was instituted in September last year, before even the first commercial Constellation was delivered, and since that time exhaustive tests of the system have been made by the engine and aircraft manufacturers.

The test flights disclosed that the introduction of fuel directly into the engine cylinders, in place of the conventional method of pre-mixing air and fuel in the carburettor, gave a marked increased in efficiency. The payload capacity of the aircraft is now said to be increased by 900 lb on long-range flights, this being equivalent to four additional passengers on the trans-Atlantic route. The engineers also claim that there is less engine vibration and noise, giving altogether a smoother operation.

I.A.T.A. ANNUAL MEETING

THE second annual meeting of the International Air Transport Association is convened for October 29th in the Heliopolis Hotel, Cairo. Airline representatives of thirty-five countries will discuss, amongst other things, the establishment of an international airline clearing house and a comprehensive international communications code for airline use. Additional matters include the appointments to the Standing Committees, the budget, and amendments to the Articles of Association.

Dr. Hafez Afifi Pasha, president of Misr Airlines, Egypt, and former chairman of the United Nations Security Council, will take office as president of I.A.T.A. at the opening meeting, in succession to Mr. H. J. Symington, president of Trans-Canada Airlines. Sir William Hildred, the Director-General of I.A.T.A., will give his report on the re-establishment and improvement of international civil air transport in the first year of peacetime civil aviation, and it is understood that he will outline the Association's plans for the coming year. The Financial, Legal, Technical and Traffic Committees will also render reports.

The meeting will also hear of the activities of the Regional I.A.T.A. Traffic Conference, through which the airlines concerned in various portions of the international air transport system apply I.A.T.A. principles of uniformity and stan-

CIVIL AVIATION NEWS

dardization to actual traffic. Other international organizations which have been invited to send representatives include the United Nations, P.I.C.A.O., Universal Postal Union, Comité International Technique d'Experts Juridiques Acriens, and the International Chamber of Commerce. The Air Transport Association of the United States has also been invited.

The I.A.T.A. Executive Committee, of which Mr. John Slater, of American Overseas Airlines, is chairman, will hold a preparatory meeting at Mena House on October 22nd.

PACIFIC FLYING AIDS

A COMMUNIQUE has been issued by the committees of the South Pacific Air Transport Council which have been sitting in Wellington.

The results achieved will assist the Commonwealth countries in providing the facilities which are necessary for the safe, efficient and regular operation of civil air services throughout the South Pacific. Radio aids to navigation, communications, air traffic control, airfield facilities, search and rescue, and meteorological services are to be provided. The production of equipment which would be sufficiently light and compact for installation in civil aircraft to give a picture of dangerous cloud formations would be an aid to safer tropical flying.

Experiments are at the moment being conducted in the Singapore region by the R.A.F., and at the recent P.I.C.A.O. demonstrations at Malvern a cloud detector was shown to the delegates. Ground radar equipment is of sufficiently high power to enable the detection of storms at much greater distances than are at present possible with airborne apparatus, and it is known that the existing equipment can indicate storms of moderate intensity at distances of 100 to 150 miles. Several airfields in South East Asia are already fitted. Research is progressing to discover the best means of detecting storm areas at greater ranges. In South East Asia, however, the vast areas to be covered make it impracticable for a sufficient number of ground radar stations to be installed for adequate weather coverage, and it is in the production of suitable airborne apparatus that the scientists place their hopes.

ATLANTIC FARES REDUCED

THE reduction in fares for the transatlantic route proposed by the I.A.T.A. Conference in June has been approved by the six Governments concerned, is now effective, and will remain until February 28th, 1947. The reduction is approximately 12½ per cent and brings the return fare to less than the single fare between New York and London five years ago.

Other features include a 10 per cent discount on round trips and special discounts of 90 per cent for infants under two and 50 per cent for children between two and twelve. The new single fare from London to New York will be £80 15s and return fare £145 15s. Freight charges are also to be reduced, and from London to New York the new rate will be 5s 10d per pound.

B.E.A.'s LONDON-STOCKHOLM SERVICE

TWELVE Swedish editors were invited by British European Airways to visit England to celebrate the inauguration of the first daily British Viking service to and from Stockholm. The Swedish editors met the new Minister of Civil Aviation, and many people prominent in air matters. At the Dorchester last week, Mr. J. C. Henry, sales manager of B.E.A., welcomed the party at an informal dinner and stressed the benefit to this country and Sweden of quick and regular communication. Dr. B. O. Willners, assistant director of Radiojänst, the Swedish B.B.C., in his acknowledgment, said that the experience of crossing the North Sea and converging upon the lights of London would live long in the memory of his confrères.

AIR TRAFFIC ORGANIZATION

THE control of air traffic is almost certainly the most important problem confronting international aviation, and it is at present receiving the attention to which it is entitled.

In the United Kingdom the Minister for Civil Aviation is ultimately responsible for the provision of control. For this purpose a large organization within the Ministry is established, under the Director-General of Technical Services, Air Vice-Marshal A. C. Collier. He is assisted by a Director of Control and Navigation, and a Director of Telecommunications.

The Director of Control and Navigation is responsible for determining the operational requirements for the provision and development of navigational instruments and radio and radar aids, and also the development of control procedures. The Air Traffic Control Service is controlled by this same Director, and is an organization employing officers in three grades for implementing the policy. The establishment at each station depends upon the importance of the control, area, local or approach, and also on the density of traffic at the airport or in the area. The Air Traffic Control officers are trained by the Ministry before posting to control stations.

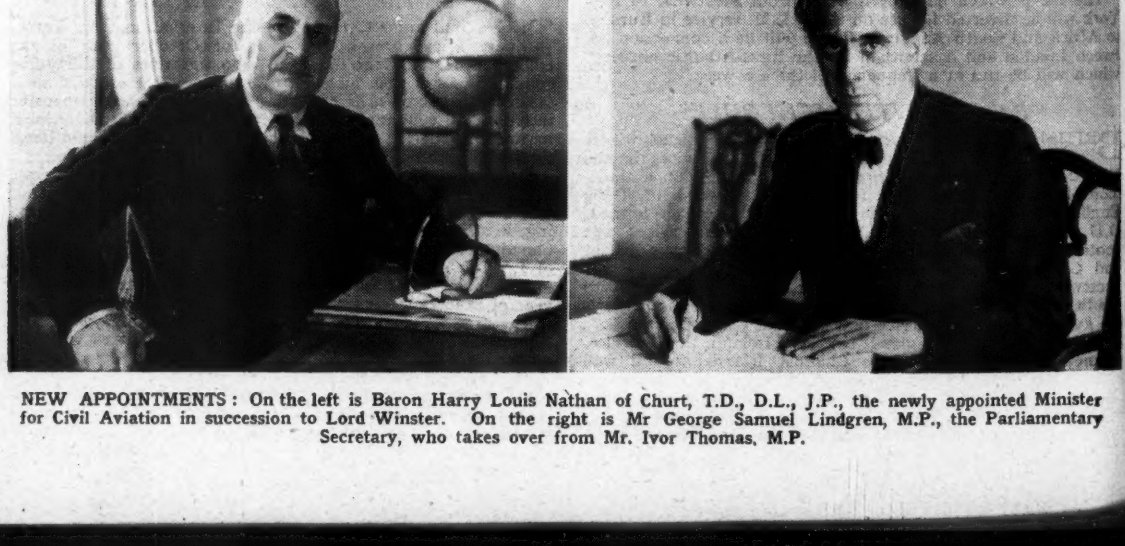
The Director of Telecommunications is responsible for the provision, on the basis of stated operational requirements, of all radio and radar aids to navigation and all other telecommunication services, and for their operation and maintenance.

Civil air traffic control is at present functioning at twenty-six airports in the United Kingdom, and the Ministry plans to extend this service to some fifty-five airports within the next six months.

TURKISH RESTRICTIONS

THE Turkish Government have prohibited the flight of all civil aircraft into or across Turkey without special permission from the Turkish Ministry of Foreign Affairs. In future, aircraft arriving in Turkey without permission will be detained until the necessary formalities are completed.

Pilots of the United Kingdom wishing to fly over Turkish territory must conform with the regulations in *Notice to Airmen* No. 24 of 1945. This *Notice* requires that full particulars shall be given to the Ministry of Civil Aviation (C.O.2), Ariel House, W.C.2, Holborn 3434, Ext. 869, as long as possible before the proposed flight.



NEW APPOINTMENTS: On the left is Baron Harry Louis Nathan of Churt, T.D., D.L., J.P., the newly appointed Minister for Civil Aviation in succession to Lord Winster. On the right is Mr George Samuel Lindgren, M.P., the Parliamentary Secretary, who takes over from Mr. Ivor Thomas, M.P.

ACCIDENT PREVENTION

THE Air Ministry Directorate of Accident Prevention have produced a film to show how every member of the R.A.F. is concerned in the prevention of accidents. The title of the film is *We Are All In It*, and the story is written around a Group Capt. of the Directorate and an officer who has reported to him for duty as an Accident Prevention Adviser. To explain the function of the department, several typical accidents are run through in customary flashback technique, and very interesting and impressive they are.

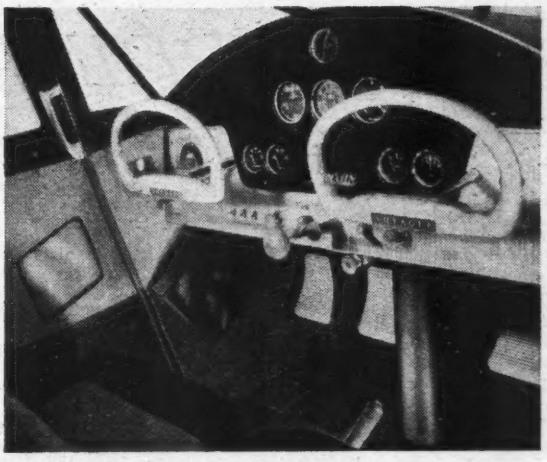
The film is not so much concerned with general flying accidents as with those which are attributable to a combination of incidents, so emphasizing that every man and woman can behave in such a manner that, without knowledge of so doing, they contribute to accidents. The lesson is not limited to those in the R.A.F.—in fact not even to aircraft accidents only, but may be applied to almost any sphere. It would obviously be unwise for the layman to see some of the incidents, but the personnel at civil airports would certainly benefit, because it is so easy for familiarity to breed carelessness.

The incidents are most realistic and some of the actual crashes quite disturbing to watch. A Mosquito attempts a belly landing after the pilot realizes that his petrol tanks are nearly empty, and the result is a complete write-off after slithering sideways off the runway across a field and through a hedge. Many small contributing incidents occur before the pilot allows himself to take off in a hurry without properly examining the F.700—and that is the moral of the film.

Other incidents include a burst tyre—as a result of "turning on one wheel"—a lorry being driven round the perimeter track crashing into a Lancaster which is unlighted and being towed by a tractor in the opposite direction, and, also, the occurrence known to so many on a badly-sited airfield, when aircraft, after landing, disappear over a hump and are not visible to the A.C.P., with the result that, if the first is delayed on the runway, a following aircraft may crash into it. The film, which will have a compulsory showing to all members of the R.A.F., should do much to make everyone accident-conscious.

R.A.F. CONTRIBUTION TO CIVIL AVIATION

THE Royal Air Force, in developing the routes to the East, has made a great contribution to the progress of transport flying in the Eastern Theatre. R.A.F. aircrew who have had personal experience of flying in weather peculiar to tropical climates give detailed briefing to the civil airline crews now operating on the trunk routes. Signals facilities, weather forecasting and information in connection with emergency landing grounds and visual and radio aids to navigation—in fact, the signals route book prepared by a special branch of the Air Force in South East Asia containing frequencies, call signs and characteristics of special aids to navigation in Malaya, navigation route sheets and coloured airfield location map drawings and runway layouts, are now all made available to the civil pilots. The R.A.F. signals channels are organized to allow civil airline aircraft continuous communication with the ground air traffic control, ensuring diversions to emergency landing grounds when necessary. B.O.A.C., Qantas Empire Airways and K.L.M. are amongst those who avail themselves of these R.A.F. services.



STINSON INTERIOR: American light aircraft, in common with automobiles, offices and bathrooms, are suffering from the attentions of the "styling" experts. Here is the somewhat idealised interior of the new Stinson Voyager 150.

FROM THE CLUBS

After six months of operation, the Luton Flying Club, which opened on March 2nd, now has 150 full flying members, while the club's fleet has increased quite considerably. Starting with two D.H. Tigers in March, there are now four of this type, two Proctors and an Auster available, while a Link trainer might also be included. As far as *ab initio* flying is concerned, forty-two pupils have gone solo and thirty-eight have obtained their "A" licences, while, needless to say, there have been a number of renewals amongst those whose flying had lapsed.

* * *

Aerosudest, which has an aircraft factory at Cannes (Alpes Maritimes) will shortly be opening a service station on the airfield there for the benefit of private aircraft pilots as well as charter services. The Society propose to carry a stock of suitable spares for British aircraft, and to offer the necessary maintenance facilities. In the meantime, so that information can be sent to the different clubs, secretaries are asked to get in touch with the Society's liaison engineer at 39, Fitzroy Square, London, W.1.

* * *

In spite of the almost continuous gale conditions which have been particularly severe on the seaboard, the South Coast Flying Club at Shoreham has, since its reopening three months ago, put in some 350 hours' flying with an Auster and two Tiger Moths. There have been eleven *ab initio* soloists and the first pupil to obtain his "A" licence has now, in fact, bought his own aircraft and has recently flown it to Switzerland. Judging from the well-known personalities who have made use of the facilities at Shoreham, this airfield appears to be regaining most of its pre-war popularity.

BREVITIES

Air France have started a service, daily with the exception of Sunday, between London and Basle, using Dakotas.

* * *

B.E.A. announce that a bar service is now provided on all their aircraft, and passengers may purchase alcoholic drinks and table waters. This is in addition to the free refreshments which are served in flight.

* * *

Panair do Brazil have started a weekly flight from Rio de Janeiro, via Africa and Lisbon, to Rome. The Lisbon to Rome section will make connections with the Pan American service from New York to Lisbon.

* * *

It is understood that the Pan American Atlantic Division has flown, since February, 1943, over eleven million miles and carried more than ninety-four thousand passengers.

* * *

British South American Airways have started an additional service between London and Rio de Janeiro. Using Yorks, the service is scheduled to leave London Airport on Saturday morning and to arrive in Rio de Janeiro on Sunday evening.

Known to many as the Public Relations Officer of the Ministry of Civil Aviation since its formation, Mr. Harold Champion has recently resigned to take up a somewhat similar appointment with British Aviation Services. He is shortly to start on an extensive overseas tour.

* * *

The following geographical names in the British Empire have been adopted by B.O.A.C. for the fleet of Yorks operating between Britain and the Middle East, India and South Africa: Marlborough, Monmouth, Melbourne, Murchison, Melrose, Melville, Mandalay, Madras, Marston, Malta, Morecambe, Moray, Montgomery, Montrose, Malvern, Marlow, Medway, Milford and Mersey. Some may consider the Imperial touch in naming the Yorks to be more in keeping with the dignity of the Corporaton than the "label" Speedbird, which has been adopted for the services and routes.

* * *

Australian National Airways claim to have created a world record for internal services for the year ending June 30th, 1946, during which time fifteen million miles were flown and 394,000 passengers were carried.

CORRESPONDENCE

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

LORD TEDDER'S WARNING

Plans for Non-Regular Services Well in Hand

From: Air Chief Marshal Sir Philip Joubert de la Ferte, K.C.B., C.M.G., D.S.O.

I AM glad that "474" in your issue of October 3rd is impatient to join some kind of non-regular service of the R.A.F. Arrangements are well in hand for the formation of the various non-regular Services and a further announcement to those already made will be made shortly.

In the case of your airman correspondent who signs himself "Per Ardua Ad Asbestos," the Air Ministry has not only anticipated many of his proposals, but has gone further in other directions. These improvements will be carried out as labour and materials become available. For example, with the present shortage of clothing it would be against the national interest suddenly to scrap all the uniforms we have and issue new ones, but a new uniform of better material and cut has been designed, and awaits His Majesty's approval.

The new airmen's club includes lounge bar, restaurant, visitors' room, lounge, and other rooms, and is nothing short of revolutionary. It is hoped to begin building a number of these clubs this year.

In the dining room for corporals and airmen, adjoining the airmen's club for convenience, the dining hall and service have been completely redesigned. The men will be served on the modern cafeteria principle and all methods of preparing the food, serving it, and washing up afterwards (by automatic washers) will be of the most modern type available. Throughout, modern mechanical aids will be used as fully as possible in dealing with food and dishes. This should reduce the "hard unenviable work" of the mess staffs, etc.

It has been decided that aircrew should have a mess of their own.

As for officers, there will have to be, as your correspondent suggests, a smaller number with a higher standard of efficiency, especially in those qualities of leadership to which your correspondent refers. Those responsible for selecting officers for permanent commissions do, I assure you, take the most careful count of all a man's qualities.

In closing, may I point out, as Lord Tedder did at his recent Press conference, that the R.A.F. is at present in a very awkward transitional stage, of which we are fully aware, and in which conditions are very often not even up to the standards of wartime. These difficult conditions are being remedied as fast as possible, but the R.A.F. must take its turn for labour and material with the rest of the nation.

P. B. JOUBERT, Air Chief Marshal.
Director of Public Relations, Air Ministry.

Trade Unions Might Help

YOUR correspondent "Per Ardua ad Asbestos" (October 3rd) is evidently a man who knows his ground, and his comments may well form the basis for further discussion, not only in the pages of your journal but at the Air Ministry.

Personally, I believe that the principal discouragement confronting would-be volunteers is the prospect—or rather lack of prospect—after having served their time. Here, I believe, the Trade Unions might help by giving some sign that they are not, as many critics would have us believe, deliberately antagonistic to the ex-Service tradesman, and that they are fully prepared to give him an opportunity to demonstrate his fitness for a post superior to that of apprentice or unskilled labourer. I believe that L.A/C Hankin, in his letter to *The Sunday Times* (October 6th), has the right idea in his suggestion that the Unions should set the final boards on the completion of Service courses.

"HOPEFUL."

DECORATIONS

Another Expression of Dissatisfaction

I HAVE read in the *Service Aviation* pages of *Flight* that His Majesty the King regards every decoration as a personal gift. No one, I think, will fail to understand, in view of the fact that 55,000 awards remain to be issued, that to present these personally would be a practical impossibility, nor will they disagree that a "personal letter" is the most expedient solution to the problem. There is, however, deep cause for dissatisfaction that so many Service personnel, whose awards for gallantry were in many instances gazetted several years ago, should have received no formal indication of when and how these decorations were to be issued, while more fortunate comrades already treasure "gongs" which are, in any case, the dearer to them for having been conferred personally by His Majesty.

It seems that instead of the Royal hand these unfortunates are proffered yet another form.

ONE OF THE GONGED.

AIR SPEED RECORD

Corrections for Temperature Needed

IS it not time that the determination of the World's Air Speed Record was conducted on more scientific lines?

It is almost as absurd to omit corrections for temperature as it would be to calculate the record speed solely from readings obtained down-wind. Surely the speed should be arrived at after correction to a Standard Temperature and Pressure!

One can almost foresee a race developing among competitors for who can produce the biggest and best "Fidos" to raise the temperature over a speed course!

RICHARD MITCHELL.

"IN THE AIR"

Appreciation of a "Grand Old Warrior"

I SHOULD like to congratulate "Indicator" on his article on the Hurricane in your issue of September 26th—to me it ranks as probably the best of the series so far.

Unlike "Indicator," I have been lucky enough to fly this grand old warrior right from the very start; I did my first trip on the fabric-winged fixed pitch type with No. 43 Squadron at Tangmere in January, 1939, and have flown practically all the main variants up to the tropicalized Marks IIC and IID for the six years following. Several times I changed over to the various marks of Spitfire, but I always rejoiced in returning to a Hurricane squadron, hopelessly outclassed as they were in the later stages of the war.

My personal impression of the fabric-winged Mark I (our first trip in those days, by the way, consisted of circuits and bumps with the wheels lowered all the way round, before we were considered competent enough for "high speed" flying!), was that it felt exactly like a flapped Hart or Hind, only without the need for such exactness in landing. It was a joy for aerobatics, in contrast to the single-seat heavy bomber which it later became!

DONALD A. S. McKAY, F/Lt.

ENCOURAGEMENT FOR FOOLS

An "Amateur's" Engine Wanted

MR. MAC ROIBIN'S enthusiastic appeal for amateur construction (*Flight*, August 22nd), with the limitations and amendments implied in your editorial, is very welcome indeed, and I feel the matter fully deserves to be discussed in detail and brought to satisfactory results. I note, however, that one point of the whole problem has been only mentioned in passing, namely, the availability of a suitable engine, but I believe that the lack of a reliable inexpensive engine is the main reason for the non-existence of the desired machine.

From personal experience in this field, I can imagine that some aeronautical engineer, with the necessary knowledge and qualifications, will be ready to write a book, on the lines of Mignet's, describing all details of airframe construction, with the addition, I would suggest, of the necessary calculations, at least for major stressed components. I also can imagine that, with the intention of using the aircraft himself or with the welcome support of an aeronautical periodical or magazine, or in connection with some aircraft concern, he will be ready to build and test a prototype, with all attached risks and expenses. I also believe that no major departure is advisable or convenient from sound and proved aircraft design and that a moderately skilled amateur, with ordinary woodworking tools, may be directed to turn out a sound job. This will be far easier, of course, if a knowledge of glider repairs or experience in aeromodelling is already available.

But I always felt that even for Mignet to fit an Aubier et Dunne or Poinsard engine, a comparatively costly and highly

CORRESPONDENCE

specialized engine, to an airframe which, apart from working hours, costs only a fraction of the engine itself, is to admit failure, if the ultimate aim was to provide an aircraft that everybody can afford.

I am not suggesting that drawings and instructions should be issued for the amateur to build his own engine. Accurate work in metal requires far more costly, bulky and complicated tooling than generally available if a real engine is to be produced. But some specialized engineer, or suitably equipped concern, should take up the matter seriously and investigate the possibility of using existing parts of motor cycle or other engine, or simplified construction, or new ideas and applications, to produce a really economical source of power for the amateur's aircraft. To achieve the simplicity of jet units in the 20-30 h.p. class, with a price that should be well under the £50 mentioned by your contributor, may still require some time, but the results recently achieved in the model field with variable compression (improperly called diesel) motors should indicate that even bold departures from the conventional may be successful.

DR. FIDIA J. PIATTELLI (A.F.R.Ae.S., M.I.A.S.).

Tandem Monoplane's Advantages

I AGREE wholeheartedly with Graham K. Gates except that he discards the tandem monoplane as unfit for this type of aviation. I think that the tandem has a great future in this field.

To get a good performance from an aircraft it is necessary to streamline and remove unnecessary appendages such as u/c, etc.

When flying with an engine of limited power this becomes even more necessary. Retracting u/cs, however, are too heavy, complicated and expensive, therefore a simple u/c is necessary and one sprung on elastic somewhat like the original Aeronca or the Flying Flea recommends itself. It is light, strong, cheap, simple and has small frontal area.

The worst appendage of the lot, however, is the empennage. It creates a lot of drag, extra weight and contributes nothing to the lift; all it does is to control. If it has to be there (and it does unless you use a tailless a/c, which is out of the question for this type of aviation, as yet) then why not make the tailplane lift? Split the weight between the front and rear mainplanes and the span can almost be halved (cheaper hangarages, etc.) and the a/c can be made inherently stable and the "dreaded" spin eliminated. Control is as usual with ailerons on the front planes and elevators on the rear. The front and rear mainplanes, full span ailerons and elevator can be made interchangeable. With half the span of an orthodox a/c the wings can easily be made cantilever, thus eliminating struts, drag and expense.

With all these obvious advantages it should be simple for some of the No. 8 hats to design a safe, simple and cheap aircraft along these lines.

One more thing—if you have to have a slipstream (and you do), why force it over the wing roots, cockpit, fuselage, etc., with all its inherent disadvantages? With this type of aircraft a pusher could be installed in the back, but perhaps that is getting too unorthodox for a too conservative public. The advantages, though, of this type are so numerous that it is impossible to quote them all in a single letter. I think there is plenty of food for thought (and action, I hope) in a design on these lines.

Wasn't there a very successful tandem monoplane sailplane a few years before the war? T. S. GOOCH.

PRIVATE FLYING

Exorbitant Landing Fees at "State" Airfields

CAN nothing be done to rid private flying of the bureaucratic stranglehold that now exists. Recently I flew over to Tollerton, about ten minutes away, to see how they were faring over there since the war. To my chagrin I found the airfield in the clutches of the Ministry of Civil Aviation and was pounced upon to pay 17s 6d landing fee for a light aircraft despite the fact that I was taking off again forthwith. That airfield was founded by the foresight, and for the use of, the citizens of Nottingham. With present Government control and entirely uneconomic scale of charges, the use of the airfield, which should be a national asset, is denied to private flying. This follows mention by the B.B.C. that the Ministry of Civil Aviation expects business men to use aircraft more. What sane business man would tolerate a fee of 17s 6d for landing at a place like Tollerton? At Derby, run by the Corporation, the fee is 5s.

I have just returned from a three weeks' tour of many Continental airfields, and nowhere did I find such extortion. At Brussels the fee was 1s 2d (with 1s 2d for hangarage if desired). From Deauville to Prague I have noted fees of a few shillings only. Why should our present Government obstruct and penalize private flying while other countries foster it? In Czechoslovakia I found posters urging every man to fly; "The Air is our Sea," "Everybody should join his aeroclub." The population there totals little more than London (14,000,000), yet they have 200 live aeroclubs of which 85 per cent run gliding schools. At one school alone I saw more first-class sailplanes than we have in the whole of Britain. The costs of a gliding training are within the reach of every lad. At Prague I saw 250,000 persons at the finest air display I have ever seen. Obviously the Czech government realizes the benefit to the nation of being airminded and airworthy. Our Government has not absorbed the lesson of 1938. Despite the fact that Britain leads the world in technical development and private enterprise, the nation as a whole is allowed to slump far behind even the small nations in practical aviation. Exorbitant landing fees render airfields which should be national assets useless monuments to the futility of bureaucratic obstruction. Instead of helping the youth of Britain to fly, the present Government is doing everything to prevent it.

J. CECIL RICE (A.R.Ae.S.).

[An editorial on this subject appeared in *Flight*, October 3rd. —ED.]

ATOMIC BOMB CARRIERS

Conflicting American Claims

DAILY newspapers this morning (October 9th) ascribe to Mr. Symington, U.S. Assistant Secretary for Air, a statement that the Superfortress is the only aircraft in large-scale production in America capable of carrying the atomic bomb.

This contradicts an announcement, authorized by the U.S. Navy, that the Lockheed P2V, similar to the record-breaking *Truculent Turtle*, will carry the bomb; in fact, I understand that Lockheeds claim that the bomb bay of this type is "fitted for atomic *bombs*."

So much for official pronouncements. It can hardly be argued that the P2V is not in "large-scale" production; certainly over 100 have been ordered, which should be adequate to handle present, or immediately projected, stocks of "A"-bombs.

In view of these American claims would it not be of some comfort to the British public to be told officially that standard British heavy bombers—at least the Lancaster and Lincoln—are suitable for carrying the bomb? *Flight* has already reported that the Superfortress is incapable of taking a 22,000 lb "Grand Slam" internally and that more extensive modification is demanded than on the older Lancaster.

"FISSIONARY."

TOO MANY ACCIDENTS

An Understandable Public Reaction

YOUR leading article entitled "Too Many Accidents" was timely, and the matter is one which I hope you will continue to emphasize. It is most unfortunate that this spate of costly crashes should occur just at a time when, if air transport is to become popular in the literal sense of the term, it is necessary to coax the public mind away from the unpleasant associations which the mere word "aircraft" has so often inspired during recent years.

The thought is prompted by a remark which I overheard in the train the other day: "Aeroplanes! Don't talk to me about aeroplanes! The only difference is that now yer pays to be killed—it used to be free." SAFETY FIRST.

"LINCOLNS AT LINDHOLME"

Formation of No. 617 Squadron

I FEEL that I cannot allow to pass uncorrected a statement made by your contributor in the article "Lincolns at Lindholme" (*Flight*, September 26th).

In it he states, speaking of No. 57 Squadron, R.A.F.: "In August, 1943, it provided the nucleus of No. 617 Squadron, famed for its dam-busting activities."

As a founder member of No. 617 Squadron I beg to point out that it was formed in March, 1943, from picked crews chosen from many famous squadrons of No. 5 Bomber Group.

The dam raid took place some time before the formation date given by your contributor, on May 16th-17th, 1943.

"NAV/B."

IN NAVAL UNIFORM: Having given exemplary service as an R.A.F. bomber, fighter, reconnaissance, and low-attack aircraft the de Havilland Mosquito has been successfully adapted to meet the requirements of Naval Aviation as a torpedo-reconnaissance machine. Above are Sea Mosquitoes of No. 811 Squadron.

Royal Air Force and Naval Aviation News and Announcements

R.A.F. Promotion—Half-yearly Recommendation Reintroduced

SUBSTANTIVE ranks for regular airmen, suspended during the war, are now to be granted, and the first award of this rank to all regular airmen, other than aircrew, who hold only temporary, warrant or N.C.O. rank, will soon be completed.

To help selection for future promotions in substantive rank, half-yearly promotion recommendations are to be introduced. In future C.O.s will send in to R.A.F. Records by the end of September and March each year the names of every substantive flight sergeant, sergeant, corporal and leading aircraftman on a regular engagement, including temporary N.C.O.s whose substantive rank is L.A/C. This list will show whether airmen are specially recommended, recommended, or not recommended for promotion.

These provisions do not apply to members of the W.A.A.F.

Royal Air Force Comforts Committee

A SURVEY of the activities of the R.A.F. Comforts Committee during the war years has now been issued under the title *Farewell Berkeley Square!* This has been prepared for the dual purpose of acknowledging the generosity of well-wishers to the R.A.F. and of making those now serving with the R.A.F. and W.A.A.F. aware of the endeavours of the Committee. Over 10 million garments were made by the public for the R.A.F. and the value of gifts reached a total of approximately 7½ million pounds sterling.

Officer i/c R.A.F. Comforts Department was J. Healy, Esq., M.B.E

Generous Tribute by U.S. General

IT is now known that an extremely generous tribute to the R.A.F. was paid by General George at a dinner given by the Los Angeles Chamber of Commerce on the evening of the United States Army Air Force's Day. Personnel of No. 35 Bomber Squadron were

THE GREAT AND THE SMALL: After receiving the freedom of Edinburgh on October 3rd, General Eisenhower acted as godfather at the christening of the C.A.S.'s son, Richard Seton Tedder. Lady Tedder is holding her son, and Mrs. Eisenhower is on the left.

guests on that occasion and the General opened his speech with the following words:—

"When I was asked if I would say a few words as a sort of introduction to the gallant members of the Royal Air Force who are with us this evening I accepted with enthusiasm. What could be easier than to introduce people who need no introduction. No one lives to-day and—because of our historians, who always chronicle the great happenings of history—no one will ever live on this earth without knowing what the Royal Air Force did for civilization."

Activity in Cyprus

IT was lately announced by the Commissioner for Police in Cyprus that recruits are required for "the Cyprus Police Force Unit, intended for guard duties at the R.A.F. Station, Nicosia."

This announcement, together with the news of the appointment of Lord Winster, former Minister of Civil Aviation, has been interpreted locally as evidence of an intention to use Cyprus as an air base. Unconfirmed reports have stated that the visit of the Chief Engineer of the Shell Company is believed to have been concerned with the building of petrol storage tanks.

It has been announced that Larnaca Airfield, in southern Cyprus, will be closed to civil aviation and used solely by the R.A.F.

Awards

THE KING has been graciously pleased to approve the following awards in recognition of distinguished services rendered during the operations in the Far East (December, 1941-February, 1942).

Appointments in the Military Division of the Most Excellent Order of the British Empire

K.B.E.

Air Vice-Marshal PAUL COPELAND MALTBY, C.B., D.S.O., A.F.C., R.A.F.

C.B.E.

Group Capt. ALAN GEORGE BISHOP, O.B.E., A.F.C., R.A.F.

O.B.E.

Wing Cdr. THOMAS CHRISTOPHER CARTER, R.A.F.V.R.
Wing Cdr. PERCY SAMUEL VICTOR VALLIS, R.A.F.
Act. Wing Cdr. GERALD BERNARD MOXON BELL, R.A.F.O.
Act. Wing Cdr. WILLIAM HENRY FRANKLIN, R.A.F.
Act. Sqn. Ldr. HUMPHREY DOUGLAS WIGHTWICK, R.A.F.V.R.

OFFICIALLY APPROVED: L.A/CW. Elizabeth Harvey has been selected from 500 applicants as a "typical W.A.A.F." and will be featured on posters. She is seen receiving the congratulations of Air Chief Marshal Sir Philip Joubert. On the right is Air Chief Commandant Lady R. E. Welsh, D.B.E.

M.B.E.

Sqn. Ldr. ROBERT DUNLOP IRWIN SCOTT, R.A.F.
Act. Sqn. Ldr. JAMES EDWARD FARWELL, R.A.F.V.R.
Flt. Lt. GEORGE EDWARD PENNIALL, R.A.F.
Flt. Lt. COURTENAY BERESFORD INGOE WILLEY, M.C., R.A.F.V.R.
F/O. ALBAN WILLIAM HOUSEGO PHILLIPS, R.A.F.V.R.
W/O GERALD ANTHONY FRANCIS, R.A.F.

D.S.O.

Wing Cdr. HAROLD JOHN MAGUIRE, R.A.F.O.
Flt. Lt. HENRY DANE, Malaya Volunteer Air Force (since deceased).
Flt. Lt. ALEXANDER ROBERTSON WILSON, R.A.F.V.R.

Military Cross

F/O. MATTHYS TAUTE, R.A.F.V.R.
F/O. ARTHUR NEEL FINLAY, R.A.F.V.R.

Distinguished Flying Cross

Wing Cdr. TERENCE ANTHONY COX, D.S.O., R.A.F.
Sqn. Ldr. IAN WILLIAM HUTCHESON, R.A.F.O.
Act. Sqn. Ldr. ERIC WILLIAM WRIGHT, D.F.M., R.A.F.V.R.
Flt. Lt. RICHARD JOSEPH ALLANSON, R.A.F.O.
Flt. Lt. MICHAEL CECIL FITZHERBERT, R.A.F.V.R.
Flt. Lt. MOWBRAY GARDEN, R.A.F.V.R.
Flt. Lt. JOSEPH CHARLES HUTTON, R.A.F.V.R.
Flt. Lt. BERNARD JAMES PARKER, R.A.F.V.R.

Military Medal

Sgt. (now W/O.) ALEXANDER KINNARD, R.A.F.
Cpl. JOHN IDWAL ROBERTS, R.A.F.
L.A/C. NOEL RANSOME MARKHAM, R.A.F.V.R.

Distinguished Flying Medal

Sgt. GORDON WILLIAM CALDER, R.A.F.
Sgt. TOM WOODS, R.A.F.V.R.

B.E.M.

Flt. Sgt. ROBERT HARRY CAMM, R.A.F.
Flt. Sgt. CHARLES ARTHUR CROSS, R.A.F.
Flt. Sgt. (now W/O.) FRANK SMITH, R.A.F.
Sgt. (now F/O.) WILLIAM EDWIN BARNDEN, R.A.F.
Cpl. JOHN CUNNINGHAM GIBBS, R.A.F.V.R.
Cpl. JOHN ERNEST SIDNEY GROVE, R.A.F.V.R.
Cpl. GALYDDER DUDLEY HOSKISON, R.A.F.
Cpl. FREDERICK WILSON, M.M., R.A.F.
L.A/C. ALFRED CLIVE BRETT, R.A.F.V.R.
A/C.1 LESLIE ALFRED JACKAM, R.A.F.V.R.

Royal Canadian Air Force

M.B.E.

F/O. BRANSTON WILMOTT MARTIN, R.C.A.F.

Royal New Zealand Air Force

Distinguished Flying Cross

Flt. Lt. ERNEST CHARLES GARTRELL, R.N.Z.A.F.
Flt. Lt. IVAN JULIAN, R.N.Z.A.F.

B.E.M.

Flt. Sgt. JOHN REES, R.N.Z.A.F.

HIS MAJESTY has been graciously pleased to approve the following awards for distinguished service in Japanese prisoner of war camps or whilst in captivity.

O.B.E.

Group Capt. GEORGE FREDERICK ALEXANDER, R.A.F.
Wing Cdr. CORNELIUS WILLIAM COFFEY, R.A.F.
Wing Cdr. CECIL HYATT NOBLE, R.A.F.
Act. Wing Cdr. GEORGE PURCELL ATKINS, R.A.F.V.R.
Act. Wing Cdr. OSWALD GORDON GREGSON, R.A.F.
Act. Wing Cdr. DONALD MACRATH, M.B., D.Ph., R.A.F.
Act. Wing Cdr. WILLIAM TREFOR HUGH NICHOLS, R.A.F.
Sqn. Ldr. WILLIAM COOKE PITTS, R.A.F., No. 1 War Crimes Investigation.
Sqn. Ldr. THE REVEREND ALAN STANLEY GILES, B.A., R.A.F.
Act. Sqn. Ldr. ROBERT ALEXANDER CUMMING, R.A.F.
Act. Sqn. Ldr. PATRICK SLANEY DAVIS, R.A.F.
Act. Sqn. Ldr. JOSEPH AIDAN MACCARTHY, G.M., R.A.F.O.

M.B.E.

Flt. Lt. PETER MORTIMER BELLINGER, R.A.F.V.R.
Flt. Lt. FREDERICK ALASTAIR FORBES, R.A.F.V.R.
Flt. Lt. DONALD SAMUEL HILL, R.A.F.O.
Flt. Lt. JOHN LILLIE, M.B., Ch.B., R.A.F.V.R.
Flt. Lt. FREDERICK WILLIAM PARKE, R.A.F.V.R.
Flt. Lt. FRANK RICHARD PHILPS, R.A.F.V.R.
Flt. Lt. WALTER NORMAN RILEY, M.R.C.S., L.R.C.P., R.A.F.V.R.
Flt. Lt. WILLIAM FITZGERALD TIERNEY, M.B., Ch.B., R.A.F.V.R.
Act. Flt. Lt. WILLIAM MANNING BLACKWOOD, R.A.F.V.R.
Act. Flt. Lt. JAMES OSWALD DYKES, R.A.F.V.R.
F/O. HARRY WILLIAM CLOSTER, R.A.F.V.R.

COSFORD CLUB: Air Vice-Marsha' Sir Alan Lees, K.C.B., C.B.E., D.S.O., A.F.C., Commander-in-Chief R.A.F. Reserve Command, chats with officers of the Cosford Club, 8, Chesterfield Gardens, W.1., at the inaugural dinner on October 2nd. The Club has been formed for past and serving officers of the A.T.C. and Civilian Committee Members. Flt. Lt. S. J. Noel-Brown is Chairman.

SERVICE AVIATION

F/O. REGINALD HARVEY GIBBS, R.A.F.V.R.
F/O. JEFFREY SKINNER, R.A.F.V.R.
W/O. HERBERT BARDSLEY, R.A.F.
W/O. FREDERICK HENRY TOLLISON, R.A.F.
W/O. SIDNEY RICHARD VICKERS, R.A.F.

George Medal

F/O. DENIS BRIAN MASON, R.A.F.V.R.

Distinguished Conduct Medal

Sgt. RALPH JAMES HARDY, R.A.F.

B.E.M.

Flt. Sgt. JACK SOFTON ALMOND, R.A.F.
Flt. Sgt. LESLIE WILLIAM MATTHEW BULLOCK, R.A.F.V.R.
Flt. Sgt. REGINALD THOMAS FOLLEY, R.A.F.
Sgt. (now W/O.) LEONARD THOMAS ALEXANDER BECKETT, R.A.F.
Sgt. JOSEPH EDMUNDS, R.A.F.
L.A/C. HARRY GILBERT MACDONALD, R.A.F.
Sgt. (now W/O.) HAYES HARDING, R.A.F.V.R.
Sgt. GEORGE HENRY STEWART, R.A.F.
Cpl. THOMAS CLARK, R.A.F.V.R.
Cpl. ERNEST HENRY PREECE, R.A.F.
L.A/C. JOHN FISHER, R.A.F.V.R.
L.A/C. WILLIAM HORACE PROCTOR, R.A.F.V.R.
A/C.1 CLARENCE ECCLESTONE, R.A.F.V.R.

Courier Flights over Jugoslavia Suspended

IT has been officially announced in Rome that all courier flights between Italy and Belgrade, Sofia and Bucharest have been suspended. This move follo : the forcing down of an R.A.F. Dakota at Nish, in Jugoslavia, while on regular flight from Bucharest to Bari, Italy.

Big Day for 245 Squadron

THE Governor of Northern Rhodesia, Sir John Waddington, with Lady Waddington, was to visit No. 245 Northern Rhodesian Squadron (Meteors) at Horsham St. Faith on Monday, October 14th.

To 183 Squadron Members

IT is requested by Mrs. C. Hill, of 15, Club Lane, Pietermaritzburg, Natal, South Africa, that any member of No. 183 Squadron, 2nd T.A.F., B.E.F., who can give information concerning the last flight of her son, Lt. A. G. Hill, S.A.A.F., on February 2nd, 1945, should communicate with her. Mrs. Hill is anxious to know how and where her son fell.

Northolt Demobbed

NORTHOLT airfield, base of the Polish fighter squadrons in the Battle of Britain, has been quietly "demobbed." For some time, civil aviation has been gradually taking over from R.A.F. Transport Command, who in turn, used the airfield after Fighter Command.

About D-Day, Northolt began to lose its character as essentially a fighter station. American aircraft of all kinds used it, besides Mosquitos of a Photographic Reconnaissance Unit and heavy transport aircraft. Soon it became necessary to enlarge and extend the runways. While this was being done, Ansons flew the Air Delivery Letter Service to all parts of Europe. Finally, Northolt was handed over to Transport Command, and last year No. 24 Squadron made it a main London terminal for flying V.I.P.s. It was then suggested that the R.A.F. should share the airfield with civil aviation This "partnership" continued until Northolt came under the Ministry of Civil Aviation.

The badge of No. 331 (Norwegian) Squadron—"For Norge."

SHEPHERDING THE STAFF COLLEGE : Features of the Nene-Lancastrian are pointed out by Capt. R. T. Shepherd, Rolls-Royce test pilot, to members of the R.A.F. Staff College who visited the Avro airfield at Woodford on October 4th. Led by Group Capt. M. G. Philpott, the party consisted of officers from twelve different countries.

"Aries" Records Homologated

IT is announced by the Royal Aero Club that three speed records between recognized points, recently established by the modified Lancaster *Aries* (four Rolls-Royce Merlin XXIV/II engines) have been homologated by the F.A.I. The crew consisted of Air Commodore N. H. D'Aeth, C.B.E., R.A.F.; Sqn. Ldr. J. S. Aldridge, R.A.F.; and Flt. Lt. D. D. Hurditch, R.A.A.F. (pilots); Sqn. Ldr. J. G. Messenger, D.F.C., R.A.F.; Sqn. Ldr. J. J. McDowell, M.B.E., R.N.Z.A.F.; and Flt. Lt. D. A. Woof, R.A.F. (navigators); F/O. T. H. Graham, R.A.F.; Flt. Sgt. L. K. Dobson, R.A.F. (radio operators); F/O. R. M. Cooke, R.A.F.; Flt. Sgt. A. E. C. Brookin and Corporal R. M. Stone (flight engineers); and Group Capt. A. J. Stapleton, D.S.O., D.F.C., R.A.F. (passenger).

The records were:—(a) London-Karachi, 6,349.921 km (3,945.81 miles); left London (Blackbushe) 12.39 G.M.T. August 21st, 1946, arrived Karachi (Mauripur) 07.53 G.M.T. August 22nd, 1946. Duration 19 hr 14 min. *Speed* 330.15 km/hr, 205.15 m.p.h.

(b) London - Darwin (Australia) 13,903.259 km (8,639.81 miles); arrived Darwin 10.14 hr, August 23rd, 1946. Duration 45 hr 35 min. *Speed* 305.009 km/hr (205.15 m.p.h.)

(c) London-Wellington (New Zealand) 18,744.423 km (11,647.75 miles); arrived Wellington (Ohakea) 00.29 hr G.M.T. August 24th, 1946. Duration 59 hr 50 min. *Speed* 313.270 km/hr (194.65 m.p.h.).

The badge of No. 288 R.A.F. Squadron—"Honour through Deeds."

The badge of No. 62 Bomber Squadron R.A.F.—"Insperato" (Unexpectedly).

Airmen Farmers

IN their spare time R.A.F. aircrews of the B.A.F.O. Communications Wing have turned parts of the airfield at Buckeburg, Germany, into a flourishing 30-acre farm, it is reported by the Air Ministry.

Almost every inch of the ground, from runway to perimeter-track has been ploughed up. A vast amount of vegetables—36,000 lettuces alone—has been cultivated in the last few months. Livestock is reared, and the unit has an unfailing supply of fresh pork, chickens and eggs.

Squadron Leader R. E. Baerlein has been mainly responsible for the success of the scheme. A former agricultural student, he seized the chance to gain practical outdoor experience. As personal pilot to Lieut. General Sir R. L. McCreery, K.C.B., K.B.E., D.S.O., M.C., Rhine Army Commander, he flies with navigator, F/O Jock Smith. Together, they developed the idea of a farm, which has been far outstripped by results.

Shortage of labour, and demobilization besides, has restricted the endless possibilities of the scheme, but the Buckeburg airmen-cum-farmers have great hopes for next year.

This Air Force farm is not run at the expense of local German food growers. All cultivation is confined to the airfield.